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ABSTRACT

This guide provides an overview of the National Education Research and Development Centers sponsored by the Office of Research of the U.S. Department of Education. Information provided for each of 23 centers includes the nature of the center's work, its location, and the names of its principal researchers. Center listings are divided into two groups. For centers that have been in operation for at least 3 years, accomplishments, research findings, and publications are reported; for newer centers, major research areas are described. The guide is intended for three primary audiences: (1) practitioners (to locate information about recent research developments and researchers in particular fields); (2) researchers (to help coordinate collective efforts on particular topics); and (3) funders of research (to keep informed about progress of work in the areas covered by the centers). (GL)

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Education Research and Development Centers

Major Research Findings, Selected Accomplishments, and Publications 1985–1988

Project Officers

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Office of Research
Office of Educational Research and Improvement

October 1989

U.S. Department of Education
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Preface

This publication provides an overview of the National Education Research and Development Centers sponsored by the Office of Research of the United States Department of Education. For each center, the book describes the nature of the institution's work, tells where the center is located, and lists the principal researchers. In addition, for the purpose of this publication, the centers are divided into two groups. For centers that have been in operation for at least three years, we report accomplishments, research findings, and publications. For the newer centers, we describe the areas of research that are being studied.

This material should be of interest to a number of audiences. First, this publication provides practitioners information about recent research developments in particular fields. Practitioners can also use this book as a reference to expert researchers in specific fields. Second, researchers themselves can use this document to help them better coordinate their collective efforts on particular topics. Third, funders of research can use this publication to gain some insight into the progress of work in the areas covered by the centers. This, in turn, helps guide decisions regarding what new work might be most productive.

The material in this book has been provided and reviewed by center liaisons at the Office of Research in the U.S. Department of Education, and by the center directors at the respective institutions. We gratefully acknowledge the input of these individuals. We should note that the relative maturity of the work reported in this document varies from center to center and from project to project. For example, some research findings are preliminary; others are well grounded on numerous replications. Readers wishing further information about particular center projects are encouraged to contact centers directly.

This publication was conceived, designed, and developed by James Fox. The material in this book was compiled by Catherine Saunders. We hope this overview is a useful guide to the work of the National Education Research and Development Centers.

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Section I

EDUCATIONAL TECHNOLOGY CENTER

Harvard Graduate School of Education
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Co-Directors: Judah L. Schwartz
Martha Stone Wiske

Affiliated Organizations: Cambridge, Newton, Ware, and Watertown, Massachusetts school systems; Children's Television Workshop; Education Collaborative for Greater Boston; Education Development Center; Educational Testing Service; Interactive Training Systems; and WGBH Educational Foundation.

Mission:

The Center's goal is to study ways of using the computer and other information technologies to teach for understanding in K-12 science, mathematics, and computing. Research focuses on "targets of difficulty" that were identified by subject matter experts, researchers, and teachers as topics in the curriculum that were both central to their disciplines and difficult to teach and learn. Mathematics education research focuses on word problems, geometry and algebra. Projects in all three areas use the computer's capacity to provide dynamic visual representations of mathematical ideas. Science education projects examine the use of computer-based simulations to help students learn difficult conceptual distinctions such as weight from density and heat from temperature. They also focus on students' ideas about the nature and purpose of scientific work and on teaching the process skills associated with scientific inquiry. Projects in computing education include research aimed at identifying and reducing students' difficulties in learning to program, research on the educational uses of systems modeling software, and research on how to introduce teachers and students to the use of applications software such as databases and spreadsheets. Two additional projects on emerging technologies explore the educational potential of microcomputer-based conferencing and interactive videodisc.

Programs of Research	Principal Investigators
Mathematics Education Program	James J. Kaput
Science Education Program	Susan E. Carey

Computer Education Program — David N. Perkins

New Technologies Program — Judah L. Schwartz

OERI Center Liaison: Ram Singh
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Major Research Findings

- Computer simulations that visually represent normally unobservable aspects of scientific phenomena can help students to change their deeply rooted everyday ideas -- sometimes referred to as alternative frameworks -- and to more readily grasp important accepted scientific theories and concepts. Through clinical interviews, researchers probed students' ideas about weight and density and heat and temperature, both to find out what young people already know and believe about these phenomena and to see how their ideas differ from the textbook theories they are expected to learn in science class. The Center then developed interactive computer-based conceptual models that explicate and represent these scientific concepts within an environment in which students can make and test hypotheses. For example, although density is unobservable in the real world -- students must infer it from their knowledge of weight and size -- the ETC Prototype Weight/Density software represents density in a visually quantifiable way.

- Classroom studies suggest that the weight/density simulations help students to move through five predictable levels of understanding the distinction between these two concepts. Initially attending only to weight and making no distinction between weight and density, most youngsters gradually learned the differentiation, and many were able to apply it under all conditions, including thermal expansion.

- In classroom studies of the effectiveness of Prototype Heat/Temperature software, students who used the computer models displayed a better grasp than control students of the differences between heat and temperature, especially the extensivity of heat and the intensivity of temperature. They correctly used the concept of amount of heat, their knowledge was better integrated, and they made better predictions about novel situations.

- Students have alternative frameworks not only about particular scientific concepts but also about the construction of scientific knowledge in general. For example, researchers found that most junior high school students think the purpose of science is to discover new inventions and cures. Most have no notion of science as the intellectual construction of theories, no sense of experiments as tests of ideas, and no differentiation of hypotheses, experiments, and results. Researchers designed a curricular unit to teach students not only how to carry out controlled laboratory experiments but also to address metaconceptual points about the nature and purpose of scientific inquiry. Students who have used this curriculum learn as much as those taught by traditional means about the scientific method, and they learn more about the nature and purpose of science.

- The computer's power as a representational medium enables the creation of a "concrete-to-abstract software ramp" that takes a longitudinally coherent approach to teaching students the web of mathematical ideas connecting the topics of rate, ratio, proportion, and intensive quantity. The software series created at ETC starts at the level of concrete icon-based calculation, then links this iconic representation of quantities with other more abstract and mathematically powerful representations such as tables of data, coordinate graphs, and algebraic equations. Originally envisioned as an environment for solving word problems, the software series now in prototype form spans several grade levels, taking students from the rudiments of multiplication, division, and ratio reasoning through pre-algebra. Results so far suggest that the external visual representations presented by the software help students to construct more sophisticated mental representations of the target mathematical ideas.

- Computers equipped with appropriate software can permit students to build, manipulate, and learn from educationally powerful objects that are otherwise impossible or impractical in the classroom. For example, the Center has demonstrated the potential of software entitled the GEOMETRIC SUPPOSER (developed at Education Development Center and available from Sunburst Communications, Inc.) to reintroduce an empirical component into the teaching and learning of geometry. This software eliminates the tedium of compass and straightedge, enabling students to make quick, accurate geometric constructions and measurements. Because they can quickly generate large amounts of geometric data, students are able to make and test their own conjectures about geometric relationships,

rather than simply memorizing theorems and proofs in their textbooks. Studies have shown that on tests of ability to provide arguments and formulate hypotheses, students who used the Supposer within an inquiry-based approach to learning geometry were far more likely than their counterparts in traditional classes to make conjectures about large sets of cases and to provide formal proofs.

- Students often misinterpret graphical representation of algebraic functions, and these misinterpretations sometimes lead to incorrect inferences about the relationship between graphs and functions. Using software (under development at Education Development Center) that links symbolic mathematical expressions with their graphic representations, researchers have found that issues of scale often confuse students and are now developing teaching approaches to help students overcome this confusion.

- Beginning programming students have two principal problems. First, they have difficulty reading programs and predicting how the computer will carry them out. This weakness creates problems at all stages of the programming process, including the writing, checking, debugging, and repairing of programs. Second, students have trouble "filing" information about the programming language in a way they can use later -- that is, they have trouble putting what they have learned into practice. Having identified these difficulties, ETC researchers developed a metacourse to address them. This metacourse -- a series of lessons to be interspersed throughout the regular curriculum for a semester-long beginning course in BASIC -- stresses key concepts and mental models that teachers and students can apply to any programming task they encounter. Students who have used scripted Metacourse lessons have outperformed control students on end-of-semester tests of BASIC.

- Connecting educational research to the improvement of practice can be aided through collaborative research and through continuing attention to implementation issues. Involving experienced teachers as partners in collaborative research requires time and explicit efforts to link the work of schools with the work of universities. ETC established laboratory sites in several schools to learn what implementation of the Center's innovations entails. This research revealed that incorporating technology-enhanced guided inquiry approaches into regular classrooms requires changes not only in technology but also in curriculum and in teaching approaches. Implementation assistance must therefore include not only logistical help with issues such as schedules, equipment, and curriculum materials. It may also need to support a process of teacher education through which

teachers collaboratively rethink educational goals, strategies, and roles and invent ways to connect their own wisdom with the products of educational research.

- Microcomputer-based conferencing has the potential to alleviate the isolation of secondary school teachers, both from one another and from new developments in their fields. However, observations of two networks and reports on others indicate different avenues to collegial exchange which require different network management strategies. Among unacquainted teachers who shared no common network tasks, specific information interests predominated, suggesting need for a large membership, guest experts, or access to supplementary information resources. Two other routes to collegial exchange are collaboration on structured tasks or interest in social contact among previously acquainted teachers.

Selected Accomplishments

- The Center developed an approach to teaching for understanding in mathematics and science which: (1) focuses on key concepts in these subject areas; (2) builds on students' beginning ideas; (3) engaged students in a process of constructing knowledge that fosters understanding of key concepts, of models, and of the processes of mathematical and scientific reasoning; (4) takes advantage of new technologies to collect and sort data, represent and manipulate concepts, model and simulate phenomena.

- The Center developed a research approach suited to its Center's mission of conducting research that will improve educational practice. This approach includes: (1) collaborative research and design teams involving teachers, researchers, subject matter experts, and curriculum and software developers in all phases of work; and (2) an integrated sequence of activities which combine research, software and curriculum development, and continual attention to issues of practical implementation in American schools. As part of this approach the Center established laboratory sites in the four school districts that are members of the ETC consortium to investigate the use of research- based innovations in real classrooms and schools.

- The Center developed a multifaceted dissemination approach including the following list of products and strategies to make the Center's work useful to a broad range of audiences:

"Making Sense of the Future", a position paper on the role of technology in science and mathematics education, was distributed to more than 25,000 practitioners, researchers, and school administrators and policymakers at local, state, and federal levels.

More than 40 technical reports present the goals, data, and conclusion of ETC projects, of interest primarily to researchers and others concerned with research results.

Three conference reports summarize themes that emerge from conferences sponsored by ETC. Directed to a general audience, each report addresses a central issue in educational technology.

Three topical papers, written by ETC associates, explore topics that complement the technical reports.

Three Videotapes, and accompanying print materials, produced jointly by ETC and Education Development Center, highlight key relationships among teachers, technology, and subject matter. This material is designed for teachers, other school people, parents and policymakers.

Two pieces of published software have been developed in conjunction with research on computer-based conferencing and classroom use of software.

Prototype software and teaching materials, produced by several projects in the course of their research, are available as experimental units to teachers and other researchers.

"Targets", a national newsletter was published three times per year and circulated to over 15,000 individuals, organizations, and school districts across the country.

In addition to these products, the Center's dissemination efforts have included four conferences, most recently a national conference entitled "Making Sense of the Future." This event, sponsored in collaboration with several other institutions doing similar work, drew over 200 educators from across the country to a series of sessions synthesizing the first five years of ETC research.

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Publications can be obtained by writing to the following address:

Publications
Educational Technology Center
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CENTER FOR LANGUAGE EDUCATION AND RESEARCH

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Affiliated Institution: Center for Applied Linguistics

Mission

The mission of this center is to assist in developing a language-competent American society. Its primary goals are to develop the English language competence and academic skills of language minority students, and to develop the second/foreign language experience and competence of English-speaking, monolingual students. In pursuit of these goals, CLEAR's staff of social science and educational researchers are involved in research, development, and dissemination activities which will improve knowledge, instruction, curriculum and materials in bilingual and foreign language education.

Programs of Research	Principal Investigators
Academic Knowledge Base	Concepción Valadez, UCLA Richard Durán, UC-Santa Barbara Joy Kreeft Peyton, CAL George Spanos, CAL JoAnn Crandall, CAL Evelyn Jacob, CAL Marguerite Ann Snow, UCLA
Professional Development of the Language Educator	JoAnn Crandall, CAL Concepción Valadez, UCLA Donna Christian, CAL
Improvement of Content of Curricula, and Programs	Donna Christian, CAL Concepción Valadez, UCLA
Linguistic and Metalinguistic Underpinnings of Academic Learning	Kenji Hakuta, UC-Santa Cruz Catherine Snow, Harvard Kathryn Lindholm, UCLA Eduardo Cascallar, UCLA

Second Language Instructional Programs	Nancy Rhodes, CAL Rebecca Oxford, CAL Marguerite Ann Snow, UCLA Russell Campbell, UCLA José Galván, UCLA Charles Stansfield, CAL
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Major Research Findings

Language Education Strategies

- A national survey of American pre-college educational institutions revealed that slightly more public than private secondary schools currently teach foreign languages (93% compared to 86%) but that they are taught at twice the rate in private as opposed to public elementary schools (34% compared to 17%). It was concluded that American educators must focus on developing a more rigorous national foreign language program, with instruction beginning in the early grades and continuing through high school, and with fluency in the foreign language, rather than mere exposure to it, as the fundamental goal.

- A study of communicative interactions in a classroom containing both language minority and majority children found that students acquired language and eventually became literate as the result of a myriad of interrelated learning steps. These learning steps were managed by a teacher who carefully erected "scaffolds" for each individual student, always adding the new language structures onto the supporting scaffold.

- A series of studies assessed the nature of translation skills in bilingual children in 4th and 5th grades. Children translated from Spanish to English and from

English to Spanish on a variety of tasks. It was found that the children made very few errors that involved intrusion across languages, which suggested that they kept the two languages well separated cognitively; their translation efficiency was best predicted by their proficiency in the language into which the translation was made; and translation ability was not related to their academic talent, but was well distributed among all the children.

- Translation activities were incorporated into a pilot curriculum for teaching Spanish to English-dominant language minority students in a Spanish-for-Spanish-speakers program in the 8th grade. It was found that translation served to motivate the students to develop their native language skills. An ethnography revealed the role that translation played in the classroom interaction.

- Two studies of adults (of mixed first language backgrounds), studying English as a second language provided information on the strategies and attitudes of successful learners. Successful learners were most likely to use specific study strategies in class, less likely during individual study, and least of all during interaction in English outside of class. Behaviors showing active use of the language, such as asking the teacher about exceptions or examples, using English at a job, or reading English to practice, were linked with higher achievement, but simply starting conversations in English was not.

- An intensive case study of a teacher's strategies in teaching language skills through a process of "interactive writing" revealed that the teacher's encouragement of the students to select their own topics resulted in more elaborate and complex writing samples.

- In a study of question/answer exchanges during math and science lessons in multicultural elementary classrooms, the features of a "good response" were identified in the verbal academic language of students described as "effective communicators" by their teachers. In general, students who were considered "effective" were adept at working with the teacher to construct this type of academic discourse.

- Studies of students enrolled in introductory college Spanish and Japanese classes provided insights into the learning strategies used by the "good language learner." Good learners, for example, employed active questioning strategies, risked making guesses about the

language, monitored their own speech and writing by correcting themselves, and used the broadcast media to expand their exposure to authentic language input. On the other hand, good learners did not memorize language chunks without analyzing them, correct themselves during natural interactions, or analyze contrasts between the native and foreign languages. These findings provided teachers with information that is readily applicable to the language classroom.

- Good versus poor 3rd and 5th grade Spanish readers were tested for their reading comprehension and oral language proficiency in English. Results indicated that the good Spanish readers performed much better than the poor readers on tasks of oral decontextualized language in both English and Spanish, especially in the 3rd grade, and were also better readers in English. For 5th graders, the differentiation between good and poor readers was less clear.

- An adjunct model of language instruction at UCLA which integrated language instruction with content instruction received very positive evaluations by the students and resulted in significant increases in students' self-confidence. Despite lower English proficiency scores, ESL students were comparable to regularly enrolled students in a simulated written examination.

Bilingual Education

- In a study of 105 elementary foreign language learners, those rated as showing the highest proficiency in a second language conversational task did not differ from those rated lower on measures of fluency, language-mixing, or self-correction, but they did differ on their ability to produce conversational turns that responded on-topic to the interlocutor while also furthering the conversation with new topic-starters. The students' performance on the conversation task showed no direct relation to their performance on a writing task, indicating that a componential model of second language proficiency is preferable to a single-proficiency model.

- In a study of elementary students in a Spanish-English bilingual program, it was found that teacher ratings of the students' native language skills predicted their writing performance in English better than ratings oftheir English skills. It was also found that a

multi-faceted assessment of English skills aided in the correct placement of children in either bilingual or mainstream classrooms.

- A study of school districts with exemplary educational programs for linguistic minority students found several patterns: (1) School officials sought ways to address the educational needs of these students before being required to do so; (2) They actively collaborated with researchers; (3) They fostered two-directional leadership--from the district level to the classroom and vice versa; (4) They engaged in constant evaluation and adjustment, with teachers and the community playing key roles in program changes; and (5) Teachers in successful schools tended to be demanding of themselves and of the programs.

Immersion Education

- A national survey of teachers in language immersion classrooms identified a series of instructional strategies/techniques that help students learn subject-matter content via a second language. These included the teachers' extensive use of body language, allowing for predictability in routine instructional tasks (assignments, homework directions, etc.), drawing on the students' existing background knowledge to aid their comprehension of new material, extensive use of visuals and/or manipulatives, and structured reviews of previously covered material.

- A study of over 600 secondary students in a bilingual partial immersion program in the San Diego area compared three instructional tracks intensive Spanish as a second language, Spanish for native speakers, and regular Spanish as a foreign language. Results supported the intensive second language model as promoting higher levels of Spanish proficiency in non-native speakers, including listening comprehension, reading comprehension, writing and speaking. This study demonstrated that foreign language courses can be tailored to the needs of students in ways that promote greater language proficiency.

- A study after the first year of implementation of an elementary school Spanish/English bilingual immersion program in the Los Angeles area demonstrated strong language development, in both languages, of native Spanish-speaking and native English-speaking students. In addition, the gains in language skills were matched with average to above average achievement test performance, whether the achievement tests were in Spanish or English. The study concluded that the bilingual immersion model was effective for both language minority and language majority students.

- The longitudinal evaluation of an "exemplary" bilingual immersion program in San Diego, which integrated Spanish and English language instruction with instruction in the core academic content areas, demonstrated strong achievement gains in reading and math in both English and Spanish language tests. The students involved in this program performed above national norms in all subject areas by the end of elementary school.

Language and Cognition

- An experimental study was conducted with first grade children in a bilingual education program to examine the nature of the transfer from Spanish to English of time and space concepts first taught in Spanish. Results confirmed that specific concepts transferred easily and suggested that transfer is a global process that involves holistic skills in the native language which serve as a foundation for the learning of specific concepts in the second language.

- In a study of formal definitions in 137 second- to fifth-grade children, half of whom were language minority, findings revealed that the sophistication of formal definitions produced by these students was related to their school achievement. The study suggested that the ability to provide sophisticated formal definitions required skill in the use of decontextualized language, and that this skill may be crucial to general success in school.

- An investigation of language and problem-solving performance of secondary school science students demonstrated that language minority students often lacked the language skills needed for the study of content areas like science. The study of seven physical science classes, which involved more than 150 language minority and majority students, revealed a relationship between language and problem-solving skills, as in the example of verbalizing the steps in solving a problem. A set of materials was developed to assist these students to acquire the needed language skills and to participate more effectively in sheltered or mainstream science classes.

- A series of psycholinguistic studies regarding syntactic and semantic language processing in bilingual and monolingual subjects found a functional difference between syntactic and semantic memory, and suggested different processing and acquisition patterns.

- In a study of 150 2nd through 5th graders, children were tested in English on a picture description task under two conditions, with or without help from the examiner. Groups of native monolingual English speakers and native English-

dominant bilinguals performed better than non-native children without the examiner's help, but not differently on the assisted task. The non-native children, all former ESL students, functioned well in challenging classroom environments, but still showed subtle deficits in English on the unassisted task. These results indicated that full acquisition of a second language for use in decontextualized and academic tasks can take several years.

- The factors most strongly affecting the English verbal reasoning skills of elementary children in a Spanish-English bilingual program were found to be: (1) Spanish verbal reasoning, (2) oral proficiency in Spanish decontextualized language, and (3) ability to take the listener's point of view in English. For the 97 bilingual program students who participated in the study (most in their 3rd or 4th year of bilingual education), verbal reasoning in Spanish was still better than in English, indicating that rapid exit from bilingual programs may artificially lower assessments of their competence.

- A study of the onset of reading among kindergarten and first grade students identified patterns of language dominance in the bilinguals and defined different aspects of language proficiency (i.e., semantic functioning and communicative competence). When tested in their weaker language, bilingual kindergarten children fell behind in basic reading ability. In the case of early reading in English, group differences were more related to differences in language proficiency and lack of formal English instruction than to differences in cognitive ability and home background.

- A study of reading strategies used by 7th grade language minority students identified a number of high-level reading comprehension strategies that were not adequately assessed by existing reading comprehension tests.

- A study of logical reasoning skills of language minority college-aged students developed a computerized technique for assessing and training students to recognize fallacious and valid logical arguments. Findings indicate that language minority students were prone to make many of the same kinds of reasoning errors as non-language minority students, and that they could benefit from the development of diagnostic profiles of their error patterns.

Selected Accomplishments

- More than 20 teachers who used interactive writing with language minority students at all grade levels were asked to evaluate their experiences. CLEAR researchers

collected and synthesized these data and prepared a handbook describing effective approaches for integrat- ing writing into a language arts/ESL program.

- Information from interviews with teachers and students provided guidelines for helping the classroom teacher to be more effective in developing the oral language skills of limited English proficient (LEP) students. The findings from this study were: (1) classroom interactions (teacher questions and student responses) were most effective when they were structured to build a collaborative response; (2) the language skills of the LEP child was enhanced by using techniques which make the social and instructional features of classroom discourse more explicit; and (3) the classroom interactive practices which were helpful to LEP students were helpful to all students.

- An innovative reading assessment procedure, which draws on recent cognitive science research, was developed for use with Hispanic youths. It involved the use of information about the student's skill in deriving meaning from the text at various levels of understanding. The analysis also provided diagnostic information about the student's comprehension skills.

- More than twelve schools in California, Connecticut, Maryland, Texas, and Virginia were involved in CLEAR's program of research and professional development. A large number of schools also received technical assistance.

- Numerous presentations have been made by CLEAR staff at school board meetings, educational practitioner meetings and workshops, parent group meetings and workshops, and conferences.

- More than 400 individuals and institutions participated in a network of practitioners and researchers interested in the use of interactive writing. A quarterly newsletter, Dialogue, was produced and distributed, and other information dissemination and networking functions were performed by CLEAR staff.

- In response to the need for information about "hard to find" language education materials, CLEAR established a database for listing existing materials, curricula, and programs in such areas as intensive foreign language instruction, the teaching of "less commonly taught" languages such as Chinese or Arabic, and the integration of language and content instruction.

- CLEAR has assisted national efforts to improve second language education by actively collaborating with groups

such as the Advocates for Language Learning, a parent organization, and the National Network for Early Language Learning, a group of elementary educators.

- Two test instruments were developed to fill significant gaps in language assessment. The CLEAR Oral Proficiency Exam (COPE) was developed for use with elementary school students to provide a measure of a language learner's ability to understand, speak, and be understood by others, with particular focus on the school context. The test, with versions in both English (for ESL students) and Spanish (for students in intensive foreign language programs), uses a role-play situation between two students to assess cognitive/academic language skills as well as social language skills. The second instrument, the Spanish FLES test, was developed for fifth and sixth graders who have been studying Spanish less intensively. It assesses listening and reading skills, and tests concepts which are most commonly included in a FLES program.

- CLEAR published an Immersion Teacher Handbook that has served as a useful resource for immersion teachers, for teachers in training, for program administrators, and for parents. The Immersion Teacher Handbook provided a detailed overview of the immersion model, including instructional methodologies, implementation strategies, assessment, and suggested readings.

- The CLEAR Instructional Materials Inventory was developed as a tool for evaluating commercially produced textbooks and other instructional materials in terms of their appropriateness for the instructional needs of linguistic minority students.

- From a nationwide search, CLEAR identified all of the programs that fit the definition of bilingual immersion education (programs that provide academic and language arts instruction in two languages). A directory of these programs was published and disseminated.

- A series of seminars on the integration of language and content learning, which were sponsored by CLEAR and the Center for Applied Linguistics, resulted in a handbook for practitioners who are interested in implementing this innovative approach for the education of limited-English speaking and foreign language students. It includes guidelines for combining language and content instruction, and descriptions of the kinds of programs and materials that either exist or need to be developed.

- Based on a comprehensive review of research, a taxonomy of second language learning strategies was published, serving as the most complete system available for classifying second language learning strategies.

- A comprehensive review of the certification requirements for teachers of ESL, bilingual education, and foreign languages--in each of the 50 states and the District of Columbia--was published and disseminated. In addition to detailed descriptions of these requirements, the many terms used by the various states to describe their certification procedures were examined, and general trends in the certification of language program teachers were highlighted.

- CLEAR conducted a series of seminars on exemplary teaching practices for language minority students. Prominent scholars and teachers from across the U.S. attended these meetings.

- CLEAR conducted a three-day Seminar on American Indian Bilingual Education. Policy, curriculum, teacher training and assessment issues were discussed by representatives of the following American Indian nations: Navajo, Pueblo, Yaqui, Cree, Choctaw, Chippewa, Lumbee.

- CLEAR has disseminated several thousand copies of their Educational and Technical reports, at no cost, to interested individuals.

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Major Research Findings

- Raising student standards was the most popular type of policy intervention in the recent wave of education reform. CPRE is conducting a longitudinal study of education reform. Forty-five states modified graduation requirements; 42

states added requirements in math, science or both. Other ways of raising student standards include new tests for graduation, increasing the length of the school day, and minimum grade point averages for graduation and or participation in extra-curricular activities.

- Graduation requirement reforms appear to be less dramatic in practice than examinations of legislative reform would indicate. Most local districts (in the six states subjected to intense examination by this Center) were already meeting most of the new state requirements.

- Nonetheless, school-level respondents report that, as a result of state reforms, more students are taking courses in academic subject areas and fewer students are taking such courses as vocational education, business education and, in some cases, art and music. The typical response to the new graduation requirements was the addition of 4 sections in math and 5 sections in science. In mostly-urban schools affected by the requirements, approximately 27 percent of the typical high school cohort is taking an extra math class; approximately 34 percent is taking an additional science class. However, even though the new courses added are in major academic areas, they have not been academic. They have generally been basic or remedial, with titles like "Math Applications" and have been intended for the non-college bound.

- Increases in student standards present both benefits and hazards for at-risk students. Practitioners report that higher course requirements, and related reforms like minimum grade point averages, make graduation a more difficult goal for at-risk students and limit the time available for remediation and retaking failed courses. These effects depend strongly on the responses of individual schools, for example, on whether schools have a five-period or seven-period day, and on how schools counsel such students.

- Reforms relating to teacher certification and compensation have been varied and extensive. More than 1,000 bills relating to these topics have been introduced in state legislatures during the 1980s. Policies to influence the teacher workforce and the quality of teaching are marked by complexity and ambiguity. Broadly speaking, policy in this area seeks to influence four matters--the supply, composition, distribution and disposition of the teacher workforce. Pursuing these four goals leads to conflict among policies and among the priorities assigned by different constituencies to these goals. For example, the imperative to raise standards for entry into teaching clashes with the

imperative to supply enough teachers and establishing legally defensible, cost-efficient entry standards collides with efforts to distinguish levels of excellence for advancement. Evidence suggests that states attempt to pursue these goals simultaneously. In the absence of state-level resolution of potential contradictions and the development of coherent strategies, responsibility for dilemma management is delegated to lower levels of the system, allowing local variation and flexibility in response to multiple, conflicting priorities.

- By 1986, 27 states had implemented policies requiring that certain levels of proficiency be demonstrated prior to admission to a college or university teacher education program and approximately two-thirds of the states had a specific program of student requirements for teacher certification. All but four states had mandated teacher competency tests in either basic skills, subject matter knowledge or professional knowledge.

- During the 1980s teacher compensation also changed dramatically, reflecting policymakers' concerns over the capacity of public schools to attract and retain talented teachers. After steep declines throughout the 1970s, teacher salaries have increased substantially in the past several years, in part, as a result of local pay increases and, in part, as a result of state legislation. At least thirteen states authorized across-the-board salary increases for all teachers. In at least 30 states, minimum starting salaries have been established.

- During the 1980s the states became quite active in developing, piloting and implementing programs that compensate teachers based on performance standards. In early 1983, no state-wide programs were sponsored for paying teachers on the basis of performance. By late 1986, all but seven states had considered one of several types of performance-based compensation systems--either a merit pay career ladder, master teacher, mentor teacher or incentive pay program.

- In the so-called first wave of state reforms, largely characterized by increased reliance on mandates and inducements around curricular intensification and improving the teacher workforce, changes in state-district roles followed two dominant patterns: (a) states assumed a greater role in specifying and monitoring expected performance at the district and school levels, which has resulted in a stronger state role; but (b) for a significant proportion of districts, this increase in state role did not result in a diminution of local influence or initiative,

rather it provided the occasion for increased local initiative and entrepreneurship.

- In the so-called second wave of reform, largely characterized by state support for restructuring, researchers have found a tendency for states to leap-frog, or bypass to the extent possible, local district organizations in favor of dealing directly with school-level actors -- teachers, administrators and parents. Similarly, district administrators are tending to bypass their own middle management, including area administrators and instructional support staff, in favor of dealing with school-level actors.

- Current proposals to restructure schools take their point of departure from at least three perspectives (1) the technical perspective which suggests that schools can be improved if teachers adopt and use new teaching techniques and techniques of instruction; (2) the professional perspective, which suggests that schools can be improved if teachers working conditions are improved to permit greater discretion and collegial interaction; and (3) the client perspective, which suggests that schools can be improved by increasing their responsiveness to clients and constituents.

Selected Accomplishments

- CPRE sponsored a comprehensive survey of programs to improve education in urban areas. The study examined the promises and pitfalls of several different types of approaches such as improving curricula, changing the structure of schooling (e.g., magnet schools, staff autonomy), expanding early childhood education, providing support systems (e.g., dropout prevention programs) and bringing additional resources into the schools. Based on this survey, the study recommended a number of promising strategies including: (1) reorganizing classroom teaching and learning to promote children's positive self-perceptions, effort and school performance, (2) providing real-life incentives for urban children to achieve at school and (3) coordinating with other institutions and agencies to provide opportunities beyond the reach of the school.

- CPRE sponsored an investigation of early childhood education. This study presents a framework for policymakers to consider when designing programs for preschool youth. It sets the debate between those who favor programs emphasizing developmental play versus those who support preschool academic programs. The report analyses various cost

considerations, noting, for example, that the average salary for childcare teachers is about half the average salary of elementary school teachers. The study notes that the two major factors affecting cost are teacher salary and class size. The report also discusses alternative funding sources such as the regular state aid formula (NJ, PA), matching grants (TX) and the project grants employed by a number of states. The work also offers recommendations for states to employ to maintain quality programs. The report recommends, for example, that childcare teachers be certified in early childhood education and the state provide technical assistance, workshops and access to experts in the field. The report and accompanying policy brief have been widely circulated. The governor's office, legislature or state education agency in seven states (OH, ME, NE, WY, RI, VA, OK) have requested multiple copies for use in study commissions or conferences on the development of early childhood policy.

- To date, CPRE has conducted five regional workshops serving more than 270 state and local policymakers and practitioners from 25 states. Participants included local superintendents and board members, teacher and parent-teacher representatives, state department of education and state legislative staff, chief state school officers, state board members, governors aides and state legislators. These workshops, co-sponsored with OERI's regional labs, covered such topics as "Assessing Education Reform," "The Costs and Benefits of Education Reform," "The Challenge of Curriculum Reform and "Changing Roles for Schools, Districts and States." As a result of workshops, policymakers in at least eight of the states (PA, KS, MS, NE, CT, MS, LA, and IL) planned continued meetings to address issues discussed at the workshops. CPRE also has co-sponsored policymaker meetings with organizations such as the Danforth Foundation and the National Governors' Association.

- Center work has appeared in a number of important publications. For example, a collection of CPRE papers on education indicators was published in the March 1988 issue of the Phi Delta Kappan. This magazine, with a circulation of 148,000, is one of the most widely read education publications. A set of CPRE papers on the "The Next Generation of Policy Research," was published in the Summer 1987 issue of Educational Evaluation and Policy Analysis. In addition, the National Governor's Association published a condensed version of a CPRE paper (Choice in Public Education) as one issue of its newsletter, Capital Ideas. Also, The National Association of State Boards of Education sent out copies of a CPRE report (on early childhood

education) to its members and to state education agency staff and published an article on the report in one of its newsletters; and The National Association of Secondary School Principals published a version of CPRE's policy brief on student standards in the March 1989 issue of their magazine which has a circulation of over 40,000.

- Over the three years of the Center's existence, Center staff have discussed their work with a total audience of more than 9,000 policymakers, practitioners and researchers including governors, governors' aides, legislators and their staff, chief state school officers, members of state and local school boards, state agency personnel, state representatives of teacher associations, executives of associations representing public and private schools, local district practitioners, and education writers.

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CENTER FOR RESEARCH ON ELEMENTARY AND MIDDLE SCHOOLS

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Mission

The mission of the Center for Research on Elementary and Middle Schools is to produce useful knowledge about how elementary and middle schools can foster growth in students' learning and development. The work of the Center is designed to produce (a) better scientific understanding of how elementary and middle schools can foster student learning of academic knowledge and skills and student development of valued personal characteristics such as strong self-concept, civic values, and independence, (b) research-based practical methods for improving the effectiveness of elementary and middle schools, and (c) specific strategies for implementing effective research-based school and classroom practices.

Programs of Research	Principal Investigators
Program on Effective Elementary Schools	Robert Slavin Nancy Karweit Henry Becker Robert Stevens
Program on Effective Middle Schools	Joyce Epstein James McPartland
Program on School Improvement	Gary Gottfredson Denise Gottfredson

OERI Center Liaison: Rene Gonzalez
Office of Research
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Major Research Findings

- Assigning students to self-contained classes according to general ability or performance level does not enhance student achievement. Grouping methods which do show positive effects on student achievement include within-

class ability grouping in mathematics, regrouping classes for reading across grade levels (the Joplin plan), and grouping which places students in flexible groups based on their performance (nongraded plans).

- Full-day kindergarten, compared to half-day, benefits the academic achievement of under-achieving and disadvantaged children.

- About 85 percent of schools that include a first grade assign first-grade teachers to self-contained classrooms. This percentage declines regularly as the grade level increases, and reaches zero percent at grade 7 and above. Conversely, departmentalized assignments do not appear until grade 4, but increase regularly to become the dominant practice in grade 7 and above.

- Departmentalized staffing may weaken teacher-student relationships while strengthening instructional quality in more specialized subjects such as science and social studies.

- School practices of staffing, scheduling, and grouping -- and thus the school's emphasis on either meeting curriculum requirements or promoting student development, are heavily influenced by grade span. Schools with the lower top grade (e.g., K-4) are more likely to resemble the typical elementary school, while schools with the higher top grade (e.g., K-8) are more likely to resemble the typical secondary school.

- Tracked mathematics classes seem to benefit high background students but not low background students, especially sixth graders in middle schools. But in elementary schools, tracking in reading is advantageous for low background students.

- Computer-assisted instruction systems of the 60's and 70's were generally more effective in raising students' scores on standardized achievement tests than were alternative approaches -- but these systems have all but disappeared with the advent of the desktop microcomputer.

- Teachers see computers as primarily helping students enjoy their school experiences more and motivating them to pay attention to their academic work. But experimental studies of computer use in schools provide little evidence of computer effectiveness for increasing student achievement.

- The type of mastery learning used most commonly in elementary and secondary schools -- group-based mastery

learning -- has no effects on students' achievement on standardized achievement tests. And the effects of group-based mastery learning on experimenter-made tests, designed to specifically test knowledge of the material being taught, are generally positive but not large and may not be maintained over time.

- A number of specific programs have been identified which offer convincing evidence that they improve the academic achievement of children who are at risk of school failure. These include kindergarten programs, in-class elementary programs, and pull-out programs. In short, the instructional programs are available right now for school districts to launch a long-term program that will improve the academic performance of most at risk students.

- Teacher practices that focus on getting parents to help their children with schoolwork at home are the most likely form of parent involvement to improve student achievement in school.

- The organizational structures and teaching practices of grades 6-8 schools (middle schools) still highly resemble the organizational structures and teaching practices of grades 7-9 schools (junior high schools), but some movement is occurring toward more balanced structures and teaching activities that are theoretically linked to positive early adolescent development.

Selected Accomplishments

- The Center has developed a program of cooperative learning that has been adopted in more than 30,000 classrooms throughout the United States.

- Center staff have identified effective programs for students at risk of school failure and produced a Sourcebook that describes these programs plus other research on achievement of at-risk students.

- The Center developed a model of elementary schooling (Success For All) based on the premise that all -- not just some or most -- elementary school students will learn the basic skills necessary for later success by the end of the sixth grade. Testing of the model, shows significant gains in reading and associated skills.

- The Center developed a set of research-based materials on middle school organization and instructional practice that identifies major components of middle school organization (grade span,scheduling, grouping, tracking), identifies

the strengths and weaknesses of each, and provides suggestions for how middle schools can balance these factors to meet their dual goals of student achievement and social development.

- Center staff provided a set of research-based information on school uses of microcomputers that identified the extent of microcomputer use in schools nationwide. The Center conducted a synthesis of research which concluded that microcomputer use in schools is extensive but disjointed and ineffective at present in improving student achievement.

- The Center developed a five-category typology of parent involvement in schooling used by schools and districts to plan their parent involvement programs. Center staff developed the Teachers Involve Parents in Schoolwork (TIPS) process for teachers to use to maintain home/school communication and actively solicit parent support in homework activities.

- Center staff identified the basic components of the principal's job at elementary and secondary levels to provide a research base for developing training modules in areas identified as essential.

- The Center collaborated extensively with a large urban school district to implement research-based innovations, and they used this experience to contribute to the literature and our understanding of the school change process.

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CENTER FOR RESEARCH ON EVALUATION, STANDARDS, AND STUDENT TESTING

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Mission

The Center's mission is to conduct research and development in the areas of testing and evaluation to assess and improve its impact on educational quality.

Programs of Research	Principal Investigator
Testing for the Improvement of Learning Program (Testing)	Eva L. Baker Robert Linn
Systems for Evaluating and Improving Educational Quality Program (Evaluation)	Eva L. Baker Robert Linn
The Impact of Testing and Evaluation on Educational Standards, Policy, and Practice Program (Impact)	Eva L. Baker Robert Linn
School Reform Assessment	Eva L. Baker Robert Linn

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Major Research Findings

- The Texas Examination of Current Administrators and Teachers (TECAT) is a basic literacy test that was administered to more than 200,000 practicing educators in March 1986. An in-depth case study of this test indicated the following:

  (1) Great statewide effort went into preparing teachers for the TECAT. The Texas Education Agency, universities, teacher organizations, districts, and regional education centers developed study guides and review materials and offered workshops. Educators spent an average of 12 hours preparing for the test.

  (2) Standards were set for a failure rate of approximately 12%; however, on the first try, only 3.3 % failed. Initial passing rates for Hispanics and black teachers were 94% and 81.6%, respectively. Overall, special education teachers and staff from group homes, P.E. teachers and coaches, and vocational education teachers (who had never been required to have college degrees) were over-represented among the failures.

  (3) Ninety percent of teachers reported that the TECAT had a demoralizing effect on them or their colleagues. Teachers felt degraded by having to study for such a low-level test. An atmosphere of stress and bitterness was created by the high-stakes of losing a job over failing the Test.

  (4) Half of the teachers interviewed said that the TECAT accomplished its purpose of weeding out incompetent teachers and reassuring the public. The other half said that negative publicity and the high passing rate made the TECAT a joke. Before and after TECAT, public support for teacher competency testing declined more than for any other educational reform.

  (5) The cost of the test was 10 times greater than expected and the failure rate was one-tenth of

that expected, resulting in a public cost per failed teacher of $30,000.

- A study of the effects of minimum competency testing for receiving a high school diploma revealed that high school students who initially fail such tests are significantly more likely to express doubts about their chances of completing the diploma.

- A study of word decoding and recognition indicated that there is a significant relationship between word frequency and word difficulty for tests of speed and accuracy and word recognition. There is also some evidence that exposure to specific words in the basal reading series has an impact on test performance by the beginning of third grade.

- The methods student use to solve problems depends more on the response required (quantitative vs. qualitative) than on how the problem is presented. Many students readily translated from word problems to formulas. Many curricula, especially in mathematics and science, are based on the notion that presenting information to students in multiple ways (pictures, words, manipulatives) will produce fuller understanding of the subject matter than presenting information in one or few representations. If students are required to give the same kind of response (e.g., numerical regardless of the way the problem is represented, the variety of representations may have only limited benefit. The potential may only be realized when the variety presentations of the given information is linked to a variety of kinds of responses required from students.

- Case studies of five sites which attempted educational reform by raising standards on tests found that:

    (1) When standards on tests are raised, safety nets are strung up (in the form of exemptions, repeated trials, softening cut-scores, etc.) to catch those who fail.

    (2) In reality, issues of excellence and quality are not paramount in setting standards. Standards are determined by consideration of politically and economically acceptable pass rates, symbolic appearances, and scarcely at all by a behavioral analysis of necessary skills and competencies.

    (3) At least in the five sites studied, reform by raising test score standards appeared to have

largely symbolic value and did little instrumentally to improve educational quality or accomplishment.

Selected Accomplishments

- The second edition of The Evaluation Kit, produced by UCLA's Center for the Study of Evaluation (CSE), was released by SAGE during FY'87. The Kit contains nine books written to guide and assist practitioners in planning and managing various kinds of evaluations (e.g., how to design a program evaluation, how to use qualitative methods in evaluation, how to measure attitudes, how to analyze data). While production of the Kit was not directly supported by OERI, it contributes greatly to organizational visibility and, indirectly, to the perceived impact of OERI centers.

- Throughout FY'87, CRESST produced three particularly successful conferences. "Making Schools Work for Underachieving Minorities: Next Steps in Research, Policy, and Practice" was co-directed by CRESST's Educational Professional in Residence (practitioner), Josie Bain, and a member of CRESST's professional staff, Pamela Aschbacher. The conference was held at UCLA on June 25 and 26, 1987 in cooperation with the National Urban League, The National Council of La Raza, and The Council of Great City Schools.

  A second conference, "Approaches to Subject Matter Assessment" met on December 10 and 11, 1987 at UCLA. This conference was held as the first step in a plan adopted by OERI's Centers to undertake a series of substantive, thematically focused meetings on their research. Over 40 participants, representing nine centers, four labs, state agencies, the National Science Foundation, and test publishers presented papers and discussed the progress of work on the issue of assessing subject matter expertise.

  Additionally, CRESST held a two-day meeting in May, 1987 to (a) discuss technical concerns surrounding state-level RFPs and (b) draft model RFPs. Participants included six state testing directors experienced in the RFP process, five commercial test companies who bid on such RFPs, and six researchers from the academic measurement community. As a result, guidelines for improving the RFP process were developed and are ready for distribution in loose leaf format so that sections may be modified according to the needs of various audiences.

- One of CRESST's on-going projects, "Toward a National Testing Network," has important implications for the design of multi-user, multi-level evaluation systems

that are both (a) responsive to individual differences at the individual, class, and school levels and (b) able to provide policymakers at the local, state, and national levels with the comparative information they require for decisionmaking. During 1987, effort was devoted to two phases in the development of a duplex design for 8th-grade mathematics. The first involved analyzing and reporting data from the field trial design carried out in 32 Illinois schools. Reports to individual students and classroom teachers were delivered in May, 1987; school and state level reports to principals, teachers and the Illinois State Board of Education were delivered over the summer. The second phase is a similar trial in California based on an improved version of the 24-booklet duplex instrument; this phase was initiated in September, 1987.

- Research at the Center for the Study of Evaluation was the basis for the design of the IEA Writing Study (18 country, international comparison).

- Bob Linn's research in reading assessment (in collaboration with the Center for the Study of Reading) is being used in the design of the new Illinois reading assessment.

- CRESST's Quality Indicators Study Group is contributing directly to the NAEP redesign study.

- CRESST's faculty and staff have been active participants on the agendas of a wide variety of policymaker and practitioner groups such as NEA, Council of Great City Schools, Council of Chief State School Officers, Educational Commission of the States, state legislators, etc.

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CENTER FOR THE STUDY OF LEARNING

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Mission

The Center seeks to create new knowledge that will be useful in teaching students how to become competent thinkers, learners, and problem solvers. The Center's research focuses on understanding the skills underlying successful thinking and learning in three areas of the school curriculum: mathematics, science, and social studies. The research is directed at children of all ability levels, from the hardest to teach to the most talented.

Programs of Research	Principal Investigators
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Science Learning	Michelene Chi Robert Glaser
Social Studies Learning	Isabel Beck John Levine James Voss
Learning Skills	Charles Perfetti

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Major Research Findings

- About Learning to Read...

  Vocabulary instruction that promotes understanding of relationships between words and discussion of word

meanings and uses can improve reading comprehension skill. In contract, narrow vocabulary instruction which focuses only on definitions does not improve comprehension.

- Revisions to texts that make them more coherent, i.e., make relationships explicit and provide background knowledge, yield better comprehension for young students. Successful revisions were, in fact, easier for students to read even though traditional readability measures would have judged these passages were now more difficult. Thus, the revisions also demonstrated the inadequacies of these traditional readability formulas.

- Young students' comprehension can be improved if reading lessons give greater attention to establishing background information and present questions that encourage students to reconstruct the story line.

  In learning new material from texts there is an interaction between general comprehension skills and specific knowledge learners bring with them of the subject matter. While the significant role of prior knowledge in the acquisition of new understandings is clear, readers can use general linguistic skills to understand texts for which they lack knowledge.

  Elementary students and college students share some of the same reading skills and deficits. College students who have reading comprehension difficulties display also basic work processing problems, just as do very young students. Most readers who have comprehension problems also have word identification and linguistic memory weaknesses.

  Learning to read increases a first grade student's sensitivity to the structure of spoken language, particularly the phonological structure.

  Early (beginning of first grade) difficulty in quickly reading words aloud strongly predicts reading comprehension difficulty in third and fourth grades regardless of whether children are taught mainly by a "decoding" or a "whole word" method. But early comprehension difficulties do not predict later word reading difficulties. The finding confirms the importance of automatic word recognition in developing reading comprehension.

- About Mathematics Learning...

  Successful elementary mathematics explanations include links between old and new concepts, demonstration with multiple representations of a concept, and proof of

legitimacy for each move. To construct such explanations, teachers require a rich knowledge of the topic and how it is learned.

The reason children have a hard time learning certain mathematical concepts (e.g., fractions) is that these concepts can be interpreted in several different ways, and standard school instruction mixes those interpretations. The result is an inconsistent message to the children.

Children regularly invent arithmetic computation procedures that are "buggy"--systematically incorrect. These buggy procedures are variants of school-taught computational rules. Their prevalence highlights the fact that instructional practice leads children to distrust their mathematical intuition and to rely excessively on formal rules.

All children, on the basis of their everyday experience, develop correct and powerful intuitions about the additive properties of numbers. Multiplicative and ratio concepts are not so easily developed in everyday experience.

It is possible to develop deep understanding of computational procedures in children by linking the procedures carefully to everyday intuitions. However, understanding a procedure does not automatically eliminate errors that had been practiced earlier.

- About Social Studies Learning...

Major social studies texts lack clear content goals, assume more sophisticated knowledge than is realistic for young learners, and fail to provide explanations adequate for students to coherently understand historical and geographical concepts.

The quality of people's reasoning about social science issues is directly related to the amount of knowledge they have about the particular issue at hand.

The direct teaching of reasoning that includes argumentation is an important tool for building understanding of social science concepts. In addition, teachers need to examine textbooks judiciously and supplement them, when necessary, with opportunities to explore a broad range of supportive reasons, causal statements and counter arguments in arriving at conclusions.

- About Science Learning...

  Students are most successful at learning to solve physics problems if they engage in self-explanations (e.g., explaining the steps of an example-solution to themselves).It may be possible to teach students skills for self-explanation and thereby increase their ability to learn even from less than ideal textbooks.

  Studies with intelligent tutor computer-based science laboratories have found several differences between effective and less effective students' scientific discovery abilities. These include individual differences in appropriate generalizing, goal setting, and planning; the structure of problem-solving search; specific discovery strategies; and memory and data management skills.

- About Learning and Higher Order Thinking Skills...

  Many of the ability differences usually attributed to children's age and developmental stage (such as memory span,...) are in fact the result of having more and better organized knowledge. Developmental stage therefore places fewer restrictions on instruction than had been thought.

  Programs successful in teaching higher order thinking abilities involve substantial social interaction and collaborative problem solving by students.

  Higher order thinking cannot be effectively assessed by multiple-choice or other precoded forms of testing. It requires instruction that engages students in relatively complex problem solving over extended periods of time.

  Expert performances in various domains have consistent characteristics such as integrated, coherent knowledge, recognition of patterns in problem solving, automated basic skills that free attention for higher level processing and abilities for self-monitoring of performance. These can guide the design of instruction and allow students and teachers to monitor students' progress.

- About Schooling...

  One cannot adequately assess the impact of desegregated schools on race relations just by examining changes in students' social attitudes. Attitudes can appear to change in a positive direction, while behaviors remain negative. This means that studies seeking to determine

effective strategies for integration must assess changes deeply, looking beyond simple attitude change measures.

An effect of using computers for instruction is a change in an important aspect of classroom structure and functioning. For example, in some classrooms grading practices and the proportion of time the teacher spends with students of different ability levels undergo change.

Elementary school children show a high degree of "rationality" in selecting co-workers. They accurately perceive the interpersonal rewards in different work situations and use information about others' performance to select "maximally-useful" co-workers for each situation (e.g., high-performance partners for cooperation and low-performance opponents for competition).

Research has shown that learning disabled and other previously segregated students can be "mainstreamed" under conditions where instruction is individualized for all students and students learn to manage their time in a self-scheduling" program.

School improvement programs can be made more effective if, as they proceed, they are continuously monitored so that mid-course corrections can be made. This is a form of evaluation activity, one that stresses a "client orientation" and the delivery of useful data for decision making in a timely fashion.

Selected Accomplishments

- Four sets of computer programs to assist development of reading skill were developed based on research done at LRDC and elsewhere. These programs, three for decoding and one for vocabulary/comprehension, are now available to schools from a commercial publisher and more than 2000 units have been sold.

- Samples of vocabulary instruction, used in our research to improve comprehension, were requested by and sent to over 1,000 educators.

- The concept of a story map, a coherent method to develop questions for reading selections, has now been incorporated in a number of commercial basal reading programs.

- An institutional collaboration with the American Federation of Teachers (AFT) has been established. In this project work is proceeding on codifying recent findings

about the teaching and learning of mathematics and translating these into materials appropriate for dissemination to classroom teachers. The joint CSL-AFT project is also developing and disseminating new models of researcher-teacher collaboration.

- In a second major collaboration, CSL researchers are working with the Association for Supervision and Curriculum Development (ASCD). Initially, four articles based on research findings appeared in the ASCD periodical for its members. A second undertaking has been the commitment of LRDC researchers to produce a Yearbook publication (in effect the Association's featured monograph) for 1989. The goal of the Yearbook is to summarize in a number of key areas what is being learned by cognitive science and related disciplines about learning and instruction in subject matter learning.

- An approach to conducting decision-oriented educational research has been developed which has proven effective at the school district level and is now being tested in state and federal levels. The approach seeks to generate data that are useful to school practitioners as they monitor and shape school improvement programs.

- Research on expert teacher has led to the development of assessment exercises for both the state of Connecticut and proposed National Board examination for the Carnegie Forum for Education and the Economy.

- Computer systems have been built that enable children to interact with dynamic models of key elementary mathematical concepts. These systems can also be used as "intelligent blackboards" for teacher led discussions.

- A microexperimental laboratory has been developed--a software system for developing experiments that is in use at 200 universities worldwide.

- A monograph, written for the National Academy Press "Education and Learning to Think" has been distributed to states and school districts nationwide, as well as professional educational associations.

- Three computer laboratories have been developed to instruct students about both science topics and effective processes of scientific discovery. The laboratories are also used to study individual differences in scientific reasoning and have led to development of an intelligent tutoring authoring system that supports the efficient design of computer laboratories in new science topics.

- The "Self-Schedulint" system, developed at the Center and used with varied forms of individualized instructional materials, is being implemented in hundreds of classrooms, nation-wide, and especially for "Mainstreaming" exceptional children.

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The Center for the Study of Learning promotes direct and expeditious publication of researchers' work through mainstream books, journals, and other forums with broad circulation among both education practitioners and the research community. For this reason, the Center does not maintain a publication series.

CENTER FOR THE STUDY OF WRITING

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Co-Directors: James Gray, Linda Flower, J. R. Hayes

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Affiliated Institution: Carnegie Mellon University

Mission

The primary mission of the Center for the Study of Writing is to improve the teaching and learning of writing from the early years through adulthood. Committed to helping all students become full-fledged participants in our literate world, the Center's research program addresses writing as (a) a means of communication, (b) a skill to be developed, and (c) a tool for learning and thinking across the disciplines. The Center encourages and promotes research that emphasizes the student as learner and the teacher's interactions with the learner. Underlying this research is the belief that effective research in writing is "practice-sensitive" and helps foster "research-sensitive" approaches on the part of educators. The Center's major objective is to build workable theories that will have conceptual and practical impact on the teaching and learning of writing as well as stimulate further research.

Programs of Research	Principal Investigators
Writing and the Writer	Anne Haas Dyson, UCB Linda Flower, CMU John R. Hayes, CMU
Writing and Instruction	Sarah W. Freedman, UCB John R. Hayes, CMU Mary Sue Ammon, UCB Paul Ammon, UCB Donald McQuade, UCB Nancy Sommers, Harvard Univ. Guadalupe Valdes, UCB Jenny Cook-Gumperz, UCB
Interactions: Writing and Reading; Writing and Speaking; Writing and Computers	Anne Haas Dyson, UCB Wallace Chafe, UC Santa Barbara

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Major Research Findings

- Emergent Literacy--Transition from Home to School:

  If classrooms were to provide opportunities for the academic and social lives of children to mix, the academic and the social could be intertwined to be mutually supportive. To pull writing out of the network of peers is to deny children the opportunity to experience literacy as something that is functional in their lives.

  There is and there can be no single description of what beginning composers do. The complex and varied processes of thinking and expression that are seen from child to child result in vastly different approaches to writing and, thus, vastly different written products. We cannot fairly judge an individual child's language skills by depending on a single standard of writing "excellence."

- Effective Instruction and Response--Transition to Secondary School in the United States and in the United Kingdom:

  U.S. teachers who successfully incorporate writing in their classrooms report that the primary importance of teaching writing is to get students to think independently; in contrast, successful U.K. teachers are more interested in having students share their imaginative experiences. We need to be alert, on the one hand, to the possibility of mechanically forcing "critical thinking" or "independent thinking" and, on the other hand, of opportunities to nourish the creative and imaginative as integral elements in the development of writing and thinking skills.

  U.S. teachers attribute their success to their curriculum and to the "process approach" to teaching writing, while U.K. teachers are more likely to attribute their success to getting to know individual students. This difference appears to be related to the fact that U.S. teachers seldom teach the same students for longer than a semester or year, while U.K. teachers often teach the same students for several years.

- Academic Literacy--Transition to the University:

  When college students engage in the typical task of reading through an assignment which serves as the springboard for writing an essay, they vary widely in the ways they read and interpret to themselves what their writing task is to be, even if students are together in the same course with the same instructor.

  College students vary widely in their awareness of their own performance or ways of knowing. This kind of awareness-- what is called metacognitive awareness--of the writing process appears not to be a well-established part of the student's writing repertory. We need to focus more on the development of these ways of knowing as we teach students to write.

- Synthesis of Research in Writing and Reading:

  Writing and reading skills develop best when students perceive the relevance and usefulness of writing and reading to their academic and personal needs. If students are to develop mastery over writing and reading, then classrooms cannot deny students their own choices for what to write and read.

  Classroom regimes that place great stress on grades or on frequent testing have the effect of undermining the learning value of class undertakings; they discourage the risk-taking necessary to learning and discovery.

- Spoken and Written Language:

  As readers, we perceive in writing the same kinds of rises and falls in pitch, accents, pauses, rhythms, and variations in voice that we perceive in speech. One of the functions of punctuation in writing seems to be to make explicit these voice qualities. Punctuation is only sometimes strictly grammatical.

- Identifying Priorities for the Study of the Writing of Hispanic Background Students:

  In the many articles written about Hispanic student writing, the students' language abilities are often treated and focused on only as problems rather than as language repertoires to build on. Hispanic students are, in a sense, penalized for knowing more than one language, as educators approach with negative perceptions these students' attempts to learn written English.

Research on the writing of Hispanic students is confounded by the inclusion of many different populations under the rubric "Hispanic," populations as varied as recent immigrants to this country who speak only Spanish to U.S.-born English speakers with Hispanic surnames, which is to say, the continuum of language users from incipient to fluent bilinguals.

Selected Accomplishments

- Seminar Series for Researchers and Practitioners. In an effort to establish and maintain strong connections with the field, CSW sponsors a seminar series at Berkeley and one at the Carnegie Mellon site. At U.C. Berkeley, the Center Seminar Series for Researchers and Practitioners, co-sponsored with the university's Departments of English and Rhetoric, focuses on noteworthy Center-related activities for developing knowledge about the teaching and learning of writing. Attendees include local teachers and school administrators, members of the U.C. Berkeley faculty and staff, faculty members from other universities and colleges, visiting scholars, students, and alumni. Attendance for these seminars ranges from approximately 25 people to over 200 people.

  The Research-for-Teaching Seminar Series at Carnegie Mellon serves as a forum for discussing research results and teaching implications with high school and college teachers and for encouraging teachers and students of writing to engage in research of their own. Several hundred teachers have participated in these seminars.

- Dissemination Network. In addition to the usual means of disseminating the results of the Center's work (e.g., through conference presentations and published articles and books), CSW collaborates with the National Writing Project (NWP) to reach a wider audience of teachers and researchers. The NWP network, based at Berkeley, consists of close to 170 teacher training sites located at universities across the nation as well as abroad. Reaching more than 535,000 teachers nationwide, NWP is part of the Center's referral network of experts on the teaching and learning of writing.

  CSW and NWP also jointly publish The Quarterly, a national publication that addresses, from the perspectives of both research and practice, current thinking in the teaching and learning of writing. For The Quarterly, the Center produces a regular feature that

reports on its research and related activities and regularly contributes articles based on individual research projects and/or seminar series talks. The Quarterly is issued four times a year and is distributed to all NWP sites, to all teacher consultant members of NWP, to all individual and institutional sponsors of NWP, and to a growing number of new constituencies. The mailing list includes more than 4000 names.

- Research Applications Series. The Center at Berkeley and the Bay Area Writing Project are co-sponsoring a program of classroom-based teacher research on writing. Several reports of research undertaken in 1987 will be published in The Quarterly. At the Center's Carnegie Mellon site, Flower and other researchers are collaborating with the Pennsylvania Writing Project and the Pittsburgh Public Schools to establish a program of teacher research on the theme of "Making Thinking Visible."

  With the National Education Association and the American Educational Research Association, the Center is coordinating a project aimed at creating a new model of collaboration between teachers and researchers through the theme of writing research. The first NEA/AERA/CSW publication will be on the topic of cultural diversity and literacy. The booklet, co-authored by Shirley Brice Heath, a Stanford University professor, and Leslie Mangiola, a teacher in the San Francisco Bay Area, is in the classroom stages.

- Resource Library and Study Room for Teachers and Researchers. The Center maintains a growing library of books, journals, articles, and audio and video tapes related to writing and to the teaching and learning of writing. In addition, the room contains conference/study facilities and several personal computers. Teachers, Center researchers, faculty from other universities and colleges, and visiting scholars use the resource room regularly for reading, study, meetings, and seminars. The resource library and study room is conveniently located in the Graduate School of Education at Berkeley and easily accessible from all parts of the Bay Area.

Publications

Books and Articles

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Center Publications

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Publications can be ordered directly from the Center for the Study of Writing at Berkeley. Phone or mail orders are accepted. An annotated list of publications, order form, and price list are available by calling (415) 643-7022 or by writing to the Center for the Study of Writing, Graduate School of Education, 5513 Tolman Hall, University of California, Berkeley, CA 94720.

NATIONAL CENTER FOR POSTSECONDARY GOVERNANCE AND FINANCE

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Mission

The mission of the Center is to improve the effectiveness, efficiency, and equity of teaching, research, and public service in postsecondary education. This mission is carried out through policy research and dissemination of information designed to improve governance, management, and finance practices. The Center is pursuing the concerns of postsecondary education at the institutional, interinstitutional, State and Federal levels. This includes: (1) promoting learning through teaching, (2) creating knowledge through research and scholarship, and (3) disseminating knowledge and providing assistance through public service activities.

Programs of Research	Principal Investigators
(1) Examining postsecondary education finance	William Massy, Lee Hansen, Jacob Stampen, Gregory Jackson, John Lee, and Richard Anderson
(2) Examining postsecondary education governance	Robert Birnbaum, Robert Berdahl, Marvin Peterson, Richard Chait, Frank Schmidtlein, Kathryn Theus, Richard Richardson, Monique Clague, and Michael Nettles

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Major Research Findings

- Minority students in universities vary greatly in terms of background characteristics--especially preparation and orientation toward education. Four student profiles are evident: (1) well-prepared students committed to education; (2) underprepared students who believe in education; (3) well-prepared students who nonetheless question the value of education; and (4) underprepared students who grew up where education was not valued.

- Successful universities work with the preparation problem through early intervention programs conducted in cooperation with elementary and secondary school districts. They also provide bridge programs for marginally underprepared high school and community college graduates. Strategies for providing financial assistance and career guidance are important elements in both forms of intervention.

- Urban community colleges and urban universities, established in the 60's as a strategy for improving access to the baccalaureate degree for disadvantaged city dwellers have frequently failed to live up to their potentials because of conflicting priorities and values.

- Urban community colleges establish barriers to student progress toward the baccalaureate to the extent that they; (1) hold low expectations for their students and adjust standards to accommodate substandard performance; (2) emphasize vocational training to the exclusion of college parallel work at institutions enrolling high proportions of minority students; (3) fail to develop strategies to address the de facto segregation of many inner city campuses; (4) permit students to enroll in college-level classes for which they lack the prerequisite preparation; (5) offer for transfer credit courses that do not match the offerings of major receiving institutions in content, rigor, or credit format; (6) fail to provide accurate and timely advice to potential transfer students; (7) lack arrangements for regular communication with major receiving institutions including faculty to faculty contact; and (8) do not systematically follow-up their former students to evaluate the strengths and weaknesses of their transfer programs.

- Urban universities establish barriers to achieving the baccalaureate by disadvantaged students when they: (1) place little emphasis on inner city community colleges in their recruiting activities; (2) provide multiple and confusing estimates of previously earned credits applicable to the intended degree program; (3) classify an excessive number of transfer courses as electives increasing the time required

to earn a degree; (4) employ few minorities as faculty members or senior administrators; (5) give inadequate attention to differences in academic preparation and culture among the disadvantaged students they admit; (6) fail to communicate regularly with counterparts at feeder community colleges; (7) criticize the performance of community college transfer students without collecting data on their performance and sharing such data with feeder institutions; and (8) encourage early transfer of community college students who were not eligible for university admission upon high school graduation.

- While there are notable exceptions (Florida, for example), a majority of state coordinating boards have tolerated significant barriers to effective transfer among their publicly-supported institutions of higher education.

- Colleges and universities can be thought of as self-correcting institutions that function by responding to problems in individual programs rather than attending to larger institutional "goals." Effective leaders in such institutions cultivate leadership within various subunits of the organization, rather than trying to personally intervene into all organizational problems, and leaders may not be required to be goal-focused rational decisionmakers, due to the self-regulating qualities of the institutions.

- Traditional ideas about effective management developed in business organizations cannot be applied to higher education. The most important work of leaders in colleges and universities is not making decisions, but "making sense" so that organizational participants develop a shared understanding of reality. A good deal of administrative work is symbolic in nature, and consists of doing things that others believe to be things typically done by good administrators.

- Significant differences exist among institutions, so that administrators must often "unlearn" lessons of their old positions in order to function effectively in their new jobs.

- Presidents can be most effective by providing for the collection and dissemination of data throughout the institution, and creating forums in which organizational participants interact on agendas of interest to the president.

- College presidents define "leadership" as a process of influence directed towards the achievement of goals, and appear to emphasize directing others rather than empowering them. College presidents are more likely to see leadership

as a one-way process of social power, rather than as a two-way process of social exchange. Presidents and faculty leaders often differ in their views of "good faculty leadership," with presidents defining faculty leadership in terms of traditional academic activities, and faculty seeing it as promoting faculty rights and welfare.

- Presidential statements indicating concern for access do not appear to be related to increased enrollment of minority students on their campuses.

- Most presidents report their most serious errors are made in the beginning of their presidential terms. Presidents report their most common error as neglecting to build or maintain good working relationships with someone important to the president or the institution.

- Campus leaders are most likely to share goals at private colleges, and least likely to share them at community colleges and universities. Consistency of goals on a campus may not be related to institutional effectiveness, and goal diversity may be important to institutional success under some circumstances.

Selected Accomplishments

- As a result of the Center's invitational conference on minority degree achievement, an informal network has been formed to advance minority achievement in higher education. The group, lead by an associate director of the center, has developed a report focusing on removing race and ethnicity as a factor in college completion.

- The Center's Forum for College Financing Alternatives has played a lead role in discussions at the state and national levels of college savings and prepayment plans. Several issues of the forum's newsletter, distributed to more than 10,000 practitioners, policymakers, and researchers, have analyzed various tuition prepayment plans and state, national, and commercial savings plans. Since the first review of college prepayment plans in an early edition of this newsletter, nearly every state has discussed such plans, several states have enacted plans, and an even greater number of individual college and commercial plans have appeared. Forum staff have worked with several states to develop prepayment plans, including an endorsed Massachusetts plan using a modification of the "standard tuition units" proposed in the first issue of the newsletter. Forum staff also analyzed the Illinois Bond Plan (a zero-coupon bond) to be presented at the annual meeting of the National Association of State Legislators.

The Forum was also one of the sources of an idea that sprung up in several places concurrently -- the use of modified U.S. Savings Bonds (tax free EE bonds if used for college) as a vehicle to help families accumulate funds for higher education.

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Birnbaum, R. "Presidential Searches and the Discovery of Organizational Goals." (OP 87:4 $4)

Birnbaum, R. "Responsibility Without Authority: The Impossible Job of the College President." (OP 88:7 $5)

Birnbaum, R. "When College Presidents are Wrong: The Effects of Knowledge Structures and Judgmental Heuristics on Administrative Inferences." (OP 87:6 $4)

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Publications may be obtained by writing to:

National Center for Postsecondary Governance and Finance
4114 CSS Building
University of Maryland
College Park, MD 20742-2435

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NATIONAL CENTER FOR RESEARCH ON TEACHER EDUCATION

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Education Matters, Inc.-Cambridge,
Massachusetts; Teachers College,
Columbia University

Mission

The National Center for Research on Teacher Education seeks to produce useful knowledge to improve the quality of teacher education. The center views teacher education as one of many influences on teachers and examines the purpose and role of programs relative to these other influences. It asks what impact various approaches or alternatives to teacher education have on teachers and how particular kinds of learning opportunities influence teachers. These questions are examined as they relate to the teaching of two academic subjects: writing and mathematics. To date, there has been more argument than inquiry about these questions, and the issues have rarely been defined in a way that allowed careful investigation. Therefore, the Center's work consists as much of conceptual development as it does of gathering empirical data. The goal is to improve and expand conceptual and empirical studies of teacher education and teacher learning and, in so doing, to help focus debates about teacher education and inform teacher education policy and practice.

Programs of Research	Principal Investigators
A Study of Program Purposes	Robert Floden
A Study of Program Character and Quality	Mary Kennedy
A Study of Teacher Learning	Mary Kennedy Robert Floden
Instrument Development	G. Williamson McDiarmid

Dissemination Sharon Feiman-Nemser

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Major Findings and Accomplishments

- Preliminary analyses of center data from teacher interviews suggest that many teachers of mathematics have a limited understanding of what they teach in this field. For example, while most prospective teaches can divide fractions using the rule to "invert and multiply," many few are able to connect any meaning to that procedure. Similarly, study findings show that prospective teacher know the steps for multiplying large numbers, yet they often cannot explain why the numbers "move over" in the partial products. A center researcher summarizes such findings as follows: "First, learning to do mathematics in school, given the ways it is typically taught, does not equip even the successful student with adequate or appropriate knowledge of or about mathematics. Second, knowing mathematics for oneself may not be the same as knowing it in order to teach it . . . . Third, subject matter knowledge does not exist separately in teaching, but shapes and is shaped by other kinds of knowledge and beliefs."

- The Center has developed a new way of measuring teachers' knowledge and changes in their knowledge. These instruments, based on a conceptual framework described in a center paper entitled "Tracking Teacher Learning," are expected to play a critical role in making teacher education a more effective intervention in preparing people to teach well. Already these instruments are being used in other countries: in Australia, at the Northern Rivers College of Advanced Education; in Sri Lanka, at the National Institute of Education; in Iceland, at the University of Iceland. A manual will be developed for widespread use of the instruments by teacher education practitioners as well as by researchers.

- The Center has developed a new approach to defining the goals for teacher education. This conception compares the education of teachers, lawyers, engineers, and those in other professions to identify four kinds of expertise which professional educators try to foster: technical skills, knowledge of general principles, the ability to engage in critical analysis, and the ability to engage in deliberate action. The analysis also examines implications of these

kinds of expertise for the practice of teacher education, and delineates current methods for fostering expertise.

- The Center has developed a new format for disseminating research findings to teacher education practitioners. The purpose of this "interactive dissemination" is to fully involve practitioners with the central issues of the research agenda, so they can understand the usefulness of the research as well as become participants in defining the research issues. This approach is designed to overcome the communication barrier which often exists between researchers and practitioners. It consists of exercises which pose real-life questions about teaching expertise and the role of experience in learning to teach. With further refinements, this approach to "diffusion of ideas" (as opposed to dissemination of products and presentations) is expected to have a long-range and significant influence on teacher education practices.

Publications

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List of Publications can be obtained by writing to:

Publication List
National Center for Research on Teacher Education
Michigan State University
College of Education
116 Erickson Hall
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NATIONAL CENTER ON EFFECTIVE SECONDARY SCHOOLS

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Mission

The Center studies how to improve student achievement in secondary schools. Special attention is directed to the needs of disadvantaged and less successful students. Research on improving academic achievement is guided by three central assumptions: (1) since the concept and measurement of achievement are problematic, the mission should not be simply to increase student scores on tests currently in use; (2) to improve academic achievement, we must first understand how to increase student engagement in academic work; and (3) although policies and conditions originating beyond the school have substantial impact on student achievement, more attention must be given to the strategies that teachers and administrators can use to alter conditions in schools so that students' engagement and achievement will be increased.

Programs of Research	Principal Investigators
Clearinghouse on Academic Achievement	Fred Newmann
Non-Instructional Influences on Adolescence Engagement and Achievement	B. Bradford Brown and Laurence Steinberg
The Stratification of Learning Opportunities in Middle and High Schools	Adam Gamoran and Martin Nystrand
Higher-Order Thinking in the High School Curriculum	Fred Newmann
Programs and Policies to Serve At-Risk Students	Gary Wehlage

Alternative Structures and the Quality of Teacher Worklife

Karen Seashore Louis

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Major Research Findings

- Within exemplary social studies departments, high levels of classroom thoughtfulness can be achieved with students of all ability levels when the department chair and principal support programmatic efforts for higher order thinking.
- Students report that classes and lessons that challenge them to use their minds are often their most engaging classes.
- Even in successful departments, significant barriers must be overcome in order to promote higher-order thinking. Some of these obstacles are large class size, lack of effective instructional materials, pressure to cover broad surveys of information which leaves little time for in-depth reflection, and teachers' sense of inadequacy in conducting discussions.
- Students at risk of dropping out come from middle as well as low SES backgrounds, and their academic achievement ranges broadly with many scoring above the 50th percentile on standardized math and reading tests.
- Conditions essential to school effectiveness with at-risk youth include a professional culture built around an extended teacher role; a sense of personal responsibility for student success; a high degree of collegiality and self-governance; and sufficient autonomy to engage in educational entrepreneurship. Successful programs served pregnant girls, inner-city blacks and Hispanics, and poor rural white youth by identifying students; common characteristics and personalizing their education.
- Students in the college track learn more than students who are not in this track, even after initial differences and selection are taken into account. Moreover, the size of the between-track achievement gap is, in most cases, larger than the achievement difference between students who stay in school and those who drop out.

- Differences in coursetaking accounts for a large portion of the achievement gap in math and science, but not in reading, vocabulary, writing, or civics. The most likely explanations for the remaining track differences are, in order of importance, differences in instruction, variation in students' attitudes toward school, and differences in students' expectations regarding future education.

- Ninth grade is a year of difficult adjustment for most students as they struggle with harder classes and the increasing significance of grades. Students report that peers are much more useful than parents in helping them make the transition to ninth grade, and that peers are a positive influence on their achievement.

- Authoritative parenting strategies appear more effective than authoritarian or permissive strategies in motivating student engagement and achievement.

- There is a notable tension between the concept of an ideal American high school for all and the reality of actual differences in school climate and classroom discourse due to class and ethnicity. This suggests the need for alternative conceptions of schooling to match reality.

- Teachers' work consists of transforming, even molding, students, but in doing this teachers depend considerably on students' good will and cooperative spirit. Therefore, students need to be treated as active partners in education.

- Teachers expect most students in a homogenous community to step into roles like those of the dominant or average adults in that community; as a consequence, if teachers perceive the community's culture as illegitimate or unacceptable, tremendous tensions will result in their own sense of mission and their relationships with students.

Selected Accomplishments

- The Center developed a monograph, Beyond Standardized Testing: Assessing Academic Achievement in the Secondary School, by Fred M. Newmann and Doug A. Archbald, which was published Summer 1988 by the National Association of Secondary School Principals. The monograph describes how to move beyond standardized tests to more accurately assess student achievement in high schools. NASSP has mailed the monograph to the more than 40,000 members of that organization; it is also available to the public through NASSP. The monograph has received the attention of national press (Education Week, NEA Today).

- As part of a long-term project on programs for at-risk youth, Center staff have developed a concept of dropout prevention that emphasizes "school membership." Successful schools create a supportive community in which students feel they belong to the school and the adults care about them. This concept is discussed in a book by Center staff to be published early 1989 by Falmer Press: Reducing the Risk: Schools as Communities of Support. The concept has been incorporated into guidelines for the New Futures Initiative; a major reform effort in five U.S. cities supported by the Annie E. Casey Foundation.

- The Center hosted a conference on structural change in secondary schools in May 1987, convening a group of practitioners and policymakers from across the country in a working session that resulted in the book, Restructuring Secondary Schools, that will be published by SUNY Press. The book includes papers by practitioners from urban and rural secondary schools who describe the difficult restructuring process; also analytic and historical commentary on the problem. The monograph is part of a long-term Center investigation into structural change in secondary schools.

- The Center regularly mails newsletters and resource bulletins to more than 4,000 practitioners, policymakers and researchers. Newsletters have covered such topics as "At-Risk Students," "Higher Order Thinking," "Standardized Testing," "Moral Education," "Choice in Urban High Schools." Resource bulletins have focused on "Discipline," "School-Business Partnerships," "Support Groups," "Cooperative Learning," and "Student Recognition Programs."

- The Center publishes a semi-annual Bibliography on topics related to secondary education that is available at no charge on a single copy basis to the general public. It also operates a Clearinghouse that performs selective database searches upon request.

- The Center publishes an on-going series of research syntheses (available at cost) on topics such as cooperative learning, staff development, stratification of learning opportunities, class size, the high school as community, the instructional role of the principal as leader, and higher order thinking in adolescents.

Publications

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To obtain copies of Center publications, please consult code.

*Publications with a single star are no longer available.
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syntheses are available at cost through the WCER Document Service, pre-paid, Rm. 242, 1025 W. Johnson St., Madison, WI 53706.

NATIONAL CENTER FOR RESEARCH TO IMPROVE POSTSECONDARY TEACHING AND LEARNING

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Mission

The Center focuses research, development and dissemination activities on college classroom learning and teaching strategies, curricular structure and integration, faculty attitudes and teaching behaviors, organizational practices, and use of emerging information technology. It emphasizes cognitive development of undergraduate students in colleges that concentrate on teaching as their primary mission. This emphasis was chosen because recent research in cognition holds great promise for improving learning and teaching in higher education.

Programs of Research	Principal Investigator
Program on Research Leadership, Design, and Integration	Wilbert J. McKeachie Joan S. Stark
Program on Classroom Teaching and Learning Strategies	Wilbert J. McKeachie Paul R. Pintrich
Program on Curricular Influences and Impacts	Joan S. Stark
Program on Faculty as a Key Resource	Robert T. Blackburn
Program on the Organizational Context for Teaching and Learning	Marvin W. Peterson
Program on Learning, Teaching, and Technology	Robert B. Kozma

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Major Research Findings

- Improvements in problem-solving and critical thinking and critical thinking abilities, which vary with each discipline, are best achieved when (a) students are involved in the discussions, (b) problem-solving methods are given explicit emphasis, (c) the dynamics of methods and strategies are expressed explicitly. Although good teachers intuitively teach students how to think, these processes must be made explicit and systematic so they can be used by other teachers.

- Reinforcement by rewards or simple praise does not necessarily increase student motivation for learning; the effect depends on the context of the instructional setting, the informational value of feedback, and the student's interpretation of feedback.

- Findings from the Motivated Strategies for Learning Questionnaire (MSLQ) under development indicate five different types of students: typically excellent and typically poor students and three types of average students. Average students include (1) those who are who are motivated but seem to lack good study skills, (2) those who have good study skills but are not confident of their abilities, and (3) those who have good study skills but are not interested in the course content. These results suggest the possibility of different types of treatments, such as study skills training or self-efficacy training, for different types of students.

- Students' study methods and test taking behavior affects, and is affected by, test anxiety. Many highly anxious students use ineffective study methods. Students need to be shown that different strategies are more effective in different circumstances. Learning strategies can be taught, but they are best taught directly and specifically.

- Unlike K-12 teachers, college faculty seldom describe making choices among alternative instructional strategies. Faculty course planning is most strongly influenced by the knowledge base of their discipline, course materials, and student characteristics.

- Individual faculty beliefs about the goals of education heavily influence course planning. Two common beliefs are (a) the effectiveness of education to help students become better thinkers and (b) the ability of education to 'make the world a better place.' Faculty commonly try to link these beliefs with characteristics of their discipline. Students generally seem aware of the personal beliefs that influence their professors.

- Despite little or no training in course planning, faculty approach the task with some excitement and creativity. It is clear from the interviews that faculty welcome the opportunity to reflect on how they plan their courses. Interestingly, some faculty have adapted portions of the NCRIPTAL survey instruments into their own course planning activities.

- Faculty behavior differs dramatically across both institutional types and disciplinary boundaries. Teaching behavior is influenced strongly by the perceived quality of the students and the resources available.

- To-date, performance evaluation of faculty has been, at best, marginal; at worst, it can produce changes opposite what is intended. No satisfactory system has evolved. A uniform system discriminates against those whose specialty does not fit the model (e.g. fine arts) and causes faculty to change their behavior to fit the existing reward structure rather than to increase their effectiveness as teachers. It appears that in order to be effective, faculty performance appraisal must be individualized.

- Faculty who believe their teaching significantly affects students devote a higher proportion of their effort to instruction.

- A survey of 300 academic administrators revealed thirty problem areas and 111 academic management practices apparently affect the quality of undergraduate education.

- Insufficient financial resources for facilities and operating support and faculty development are the most often cited barriers to improving undergraduate education. The most effective academic practices for improving undergraduate education do not, however, seem to link directly to financial resources.

- The second largest set of barriers to improving undergraduate education relate to faculty--balancing teaching and research roles, retaining good faculty, and engendering high morale. Administrators report few

institutional rewards for teaching, and they sense faculty are reluctant to change their teaching.

- Administrators report that student problems include poor attitudes toward study and scholarship and poor preparation in basic skills.

- The most commonly found academic management practices intended to improve undergraduate education relate to (1) academic planning, (2) institutionwide emphasis on undergraduate education, (3) academic management information systems, (4) admissions and enrollment management, (5) technology, and (6) faculty selection and promotion. Least common practices relate to (1) academic administration leadership, (2) faculty development, (3) and student assessment. Newest practices relate to (1) academic planning, (2) emphasis on undergraduate education, (3) admissions and enrollment management, (4) technology, and (5) student assessment.

- Administrators report the most effective practices for improving teaching and learning relate to (1) faculty recruitment (2) technology use, (3) rewarding effective teaching, (4) academic planning, and (5) emphasizing undergraduate education. Least effective practices relate to (1) student assessment, (2) administrative leadership,(3) faculty development, and (4) teaching improvement programs.

- Computers can make a significant contribution to learning in higher education in part because they can present, receive, process, and manage information as people do. Furthermore, software can be adapted to different types of learners. It allows easy individualization of lessons, greater freedom from time constraints, and greater efficiency in laboratory experiments.

- Tutorial software provides the structure needed by learners who lack relevant knowledge, skills, and strategies for learning, and it is more likely to improve verbal knowledge tasks. Guided simulations combine structure and open-endedness and are likely to benefit average students, particularly on procedural tasks. Exploratory environments are likely to benefit only self-regulated learners. Tools range from simple aids to getting work done (calculators, word processors) to sophisticated programs that challenge students to bring their own skills and knowledge to bear on the learning task.

- Currently, much of the software in higher education is 'homegrown' rather than commercially developed, although software publishers often distribute successful software.

Institutions are beginning to encourage both the development of educational software and its use in the classroom. Award programs, such as the EDUCOM/NCRIPTAL Higher Education Software Awards, encourage faculty to develop software that is educationally sound so institutions can use it with confidence.

Selected Accomplishments

- The Center established the annual EDUCOM/NCRIPTAL Higher Education Software Awards program to reward and encourage the development of computer software for undergraduate education. In its first two years, the program has elicited an overwhelming response. At the recent EDUCOM conference, over 2500 conference participants attended "The Best of 88" software awards luncheon. The majority of the software programs designed for undergraduate education in liberal arts subjects came from the natural sciences and mathematics and statistics; other subject areas included social sciences, humanities, and English composition.

- The Smoky Mountain Seminar on College Teaching and Learning brought together a group of university administrators and campus policy makers to develop projects, based on NCRIPTAL material, could be used to improve some aspect of the teaching-learning process at their home institution. Seventy-five college teachers and administrators participated in the week- long session. Participants came from all over the country and represented all types of higher education institutions. Many of the individual participants were guided to and successfully developed high quality projects which promise to have an impact beyond their immediate campus and institution.

- NCRIPTAL has developed a number of practical tools to help faculty improve their teaching: "Discussion Guide for Course Planning", "Writing Course Syllabi for Improved Communication", and an institutional self-assessment guide on academic management practices. The book on Classroom Assessment Techniques will assist faculty efforts to improve the quality of the educational experience for undergraduates.

- The Center developed and conducted a national survey of University faculty to identify the factors that motivate faculty in their roles as teachers and scholars. Another survey of 181 University presidents and other topacademic officials is also nearly completed.This simultaneous faculty and administrator study is the first of its kind;

the goal is to identify and help overcome institutional and organizational obstacles to effective undergraduate teaching and learning.

- The Center developed the Motivated Strategies for Learning Questionnaire. This instrument has been administered to over 800 students at three different institutions. This instrument is being designed to provide students with immediate diagnostic feedback that strengthens their learning strategies, motivation, and problem solving techniques.

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Publications may be requested by writing to:

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NATIONAL CENTER ON EDUCATION AND EMPLOYMENT

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Mission

The Center's research program seeks to improve the knowledge base for deciding who should teach what work-related skills to whom, when, how, and with what effects. Toward this objective it supports research by economists, cognitive psychologists, sociologists, anthropologists, historians, and policy analysts. The Center also has an active program to communicate this knowledge to those with a stake in or responsibilities for developing this nation's human capital: the business community, federal and state governments, the educational policy community, and the press.

Programs of Research	Principal Investigators
Changes in Skill Structure and Employment Processes	Thomas Bailey and Thierry Noyelle
Education and the Growth of the American Economy	Ann P. Bartel and Frank R. Lichtenberg
Cognitive Skills in the Workplace	Sylvia Scribner
Education and the Labor Market	Jacob Mincer and Joseph Altonji
Job Training and Labor Market Outcomes: Comparisons of the U.S., U.K., and Australia	Hong Tan
Mapping the Work-Related Education System: Data Needs	Thomas Glennan, Jr., and Jeannie Oakes

Community-Based Planning for Work-Related Education: Implications for Research and Policy

Thomas Glennan, Jr., James Harvey, Anthony H. Pascal, and Susan Brodilly

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Major Research Findings

- Increased international and domestic competition has created strong pressures on all levels of the production process to be more responsive to changes in tastes and demand--to "customized consumption". In both service and manufacturing industries the American economy is moving from a production-oriented to a product-oriented and customer-oriented world, from mass production to flexible production.

- When production depends on "hard" automation, the retooling required to produce varied output is very costly. A "hard" technological regime drives toward long production runs that reduce per unit cost and toward the specialization of labor and routinization of jobs. As technologies become computer-based, they become "flexible" in that retooling simply requires reprogramming, thus allowing shorter production runs and more varied or customized production. Under a flexible production regime, the objective is to combine the customizing implicit in craft production with the cost savings of mass production. Flexibility has usually been achieved by moving back up the range of skill levels, shifting from specialized to general purpose tools and machines, and reorganizing how people get the work done. In other words, the spread of micro-electronics and related technologies does not just result in new machines that must be mastered, but in a much deeper change in the way production is organized and the ways that workers relate to the production process and to each other.

- Economic changes create the demand, not just for new occupationally-specific skills, but also for cross-occupational skills that our elementary and secondary schools need to develop in all students.

- Economic changes require **strong academic skills.** Perhaps the most profound educational implication of computers in the workplace is that they force a replacement of **observational learning** with **learning acquired primarily through symbols,** whether verbal or mathematical. An example

lies in a family of technological systems known as manufacturing resource planning (MRP), systems carrying much of the burden of positioning American industries to compete and consisting of a computer-based integrated information system that coordinates data about all aspects of a company's operations. What is important about the MRP and systems like it is that they are content-free, formal, closed conceptual systems that workers at all skill levels within the firm have to use. As such, they have many of the characteristics of "school" subjects, such as mathematics or grammar, and departs in significant ways from the traditional systems of knowledge that reflect accumulated managerial and production wisdom.

- Economic changes demand **higher order cognitive thinking skills.** The shift from mass to flexible production and changes in the time frame for production combine to increase the need for higher-order cognitive thinking, even for jobs that we usually conceive of as lower skill. Time has become an important competitive weapon. Companies that can respond to product or service demand quickly gain a competitive edge. If the variation in product and service associated with flexible production multiplies the number of decisions that must be made, the time element makes it difficult to buck these decisions up and back down supervisory lines. Decisions are therefore necessarily having to be made more frequently on the shop floor and in back offices. Thus, employees in both higher and lower skill jobs are increasingly required to deal with uncertainty, the unfamiliar, and discontinuity. They have to understand the firm's market environment and the organizational context in which the job is embedded. There is a stunning parallel between the cognitive requirements of today's workplace and the defining characteristics of higher-order thinking.

- Economic changes require the **ability to self-direct.** Economic forces are flattening out company hierarchies, eliminating supervisory and middle management positions. Supervisory functions are being increasingly delegated to the worker and/or to the team, requiring of previously-supervised workers, not only the ability to make the decisions previously delegated to supervisors, but also the ability to self-regulate or self-direct.

- Economic changes require the **ability to know how to learn.** The volatility of markets produces a volatility in job tasks--from the job of claims adjuster in the insurance industry to that of operator in the textile mills. These changes imply the need to know how to learn--in other words, how to organize social and technological resources

to transform what is unfamiliar into the mastered. This process requires knowing how to identify the limits of one's own knowledge, how to ask germane questions, how to penetrate poor documentation, and how to identify sources of information. As Noyelle observes, "We are moving into an era in which the traditional separation between working and learning is disappearing, with learning becoming increasingly integrated into a person's work life."

- Economic changes require **teamwork abilities.** Under mass production, employees, especially those in factory floor and "back office" jobs, often worked alone, albeit in physical proximity to each other. As job responsibilities broaden and increasingly intermesh, workers have to function collaboratively--and classic research in social psychology shows that individual competence does not generalize to team competence. For example, pilot error accounts for an increasing percent of fatal airline crashes worldwide, and many analyses have pinpointed poor team performance as an important component of that error.

- Economic changes require **conflict resolution skills.** As the labor force becomes increasingly multicultural and job content changes rapidly and in confusing ways, communication problems also increase between workers, generating the need for interpersonal communication and conflict resolution skills. These problems self-evidently reduce productivity; more subtly, they interfere with an important social mechanism for learning on the job--peer help.

- Most surveys of employers' skill requirements are methodologically seriously flawed. For example, responses will vary, depending on the respondent's position in the company. However, most of these surveys do not systematically sample respondents either from the same functional position in companies or, in an attempt to assess variation, across functional positions.

- The employment share of professional and technical workers in the high technology sector is 2.5 times larger than it is in "other manufacturing". The rate of labor productivity grew 143 percent between 1960 and 1980 in the high technology sector as opposed to the rest of manufacturing, which grew 60 percent between 1960 and 1980. Highly educated labor is used more intensively in the "young" high technology industries than in the "mature" non-high technology industries. In other words, the U.S. comparative advantage in high technology projects is based to an important extent on the U.S. being relatively well endowed with highly educated workers.

- High technology industries are high wage industries because the introduction of new technologies increases the relative numbers of better educated and accordingly higher-wage workers. Technological change increases the relative wages of college graduates, but skill obsolescence in rapidly changing fields may act to reduce the average earning capacity of older relative to younger college graduates.

- Analyses do not support common fears of "technological unemployment." On average, in the longer run, technological change **reduces unemployment**; in the shorter run, it **does not increase unemployment.**

- In response to technological innovation, employers first hire people with more education: education provides general human capital that equips people to cope with change more effectively. As new technologies become routinized, firms expand in-house training and hire fewer well-educated, and expensive, workers. In the early stages of technological innovation in industries, wages grow faster in these than in lower-productivity-growth industries for the better-educated, but not for the less-educated. However, as the technology matures, training increases, employers increase wages to retain trainees, and wages in high-productivity-growth sectors grow faster than in lower-productivity-growth industries even for the less educated.

- Company-sponsored training is complementary to, not a substitute for, investments in basic skills.Employers train their best-educated employees: between 1967 and 1980 only 45 percent of those who failed to complete high school but 71 percent of high school completers and 79 percent of college graduates receive training from their employers. Employees who are trained in one job are also more likely than other new employees to be trained in subsequent jobs. Employer training, therefore, accentuates differences in basic education attainment and achievement among employees--differences that account for most of the differences in income among workers.

- Employer-sponsored training produces higher wages, greater increases in productivity, and smaller chances of unemployment than formal classroom training. However, employer training reinforces rather than reduces the differences in educational attainment among new employees. Well-educated people are the most likely to find employment and to receive training from their employers. Once trained, their greater productivity earns them more, they switch jobs less frequently, and they are rarely unemployed. If they change jobs, they find another more

easily and are more likely to receive further training from their new employers. Those that start their careers lacking basic skills fall further and further behind.

- The rate of return from education declined during the 1970s as the large and well-educated baby boom entered the labor market. Earnings of college graduates (during their first five years in the labor market) declined from 150 percent of similarly-experienced high school graduates in 1965 to only 130 percent in 1979. But that trend reversed dramatically during the 1980s. By 1986, competition among employers seeking well-educated employees drove up relative earnings of college graduates to 180 percent of those of high school graduates.

- Wage profiles and rates of labor turnover in Japan and the United States reflect the commitment of Japanese managers and workers to on-the-job training within the firm. After intensive selection during recruitment, workers hired in rapidly growing Japanese industries will be continuously retrained, will share in high wage growth, and will often have the opportunity for reassignment within the firm should their skills be bypassed too quickly by changing technology and knowledge in their field. Thus, high wages and low turnover are linked in Japanese practice.

- Workers who receive employer-sponsored training are less likely to leave the company that trained them; workers who move less are more likely to receive training from their employers; and workers who exhibited prior mobility exhibit less mobility once they receive training. Trained workers also change jobs within their company less often than untrained workers.

- Training, not job switching, is the quickest way to increase earnings. For the average employee, less than 15 percent of real wage gains over time results from changing jobs; 85 percent comes from being paid more for being more productive.

- Workers who have higher levels of education than the average levels in their occupations have higher rates of firm and occupational mobility than other workers with similar characteristics. When they move, they are more likely to move to occupations whose workers have higher average levels of education.

- Virtually all labor market outcome measures, including wages, job turnover, unemployment and work hours and wage growth, are correlated between parents and children.

- Intensive interviews with successful individuals who come from disadvantaged families indicate that education is a critical equalizer between this group and those from advantaged family backgrounds, especially for disadvantaged women. These interviews also support current premises about mentoring. Although asked no specific question about teachers, 65 percent of these success "surprises" spontaneously mentioned, several decades after their high school graduation, the positive influence that teachers had had in their education and in their lives.

- In the workplace, teaching and learning are integrated into and subordinated to the functional requirements of the work process. "Learning to do" and "doing" occur concurrently at work; rarely is this the case at school.

- Demographic changes mean that a growing share of the new skills needed in industry will have to be met by retraining existing workers. Since employers have traditionally met their increased needs for human capital by hiring recently educated individuals, this demographic change will pressure employers and postsecondary institutions to attend more systematically to the training needs of the experienced labor force.

- The growing demand for skills, employers' reliance on well-educated workers to integrate new technologies into the firm, and the country's demography raise the prospect that economic growth will be constrained by a lack of well-educated and trained employees. More ominously, a dual labor market is evolving. The market for unskilled labor offers shrinking opportunities and rising poverty, while the market for human capital promises rising incomes and expanding choices. The challenge to the education system is to increase the human capital of all of its clients, but especially of those outside of the economic mainstream.

Selected Accomplishments

- Center staff have prepared or helped others prepare several special background papers. These include a Special Article for the Bulletin, the journal of the National Association of Secondary School Principals; a special background paper for the leadership of the National Education Association; a synthesis paper on education and the economy for the Aspen Seminar on the Federal Role in Education, sponsored by the Carnegie Corporation, Ford Foundation, Hewlitt Foundation, Primerica Foundation, and Rockefeller Brothers

Foundation; and a special paper for a Rockefeller Foundation conference on the implications of economic changes for training disadvantaged women. The staff gave substantial technical advice to the National Alliance of Business, which functioned as staff for the "Building a Quality Workforce Initiative". This project, funded by the U.S. Departments of Education, Labor, and Commerce, culminated in a small July 1988 conference chaired by the Secretaries of Education, Labor, and Commerce. The Roundtable on Workforce Literacy, sponsored by the Education Commission of the States and the Sears-Roebuck Foundation, used Center work as background material provided participants and included Center staff among its participants.

- Center staff held special **briefings** for government policymakers. For example, we briefed Jack Jennings, Chief Counsel to the House Education and Labor Committee, and three of his staff members on research of interest to them for the reauthorization of the Vocational Education Act. We briefed a newly created team from the Governor's Office, State of New York, on retraining the experienced labor force. We briefed a team from the General Accounting Office on the implications of our research for rethinking federal training programs.

- Center staff have given a large number of **speeches** to members of the business, federal and state governmental, and educational communities. These included a Policy Forum speech for staff members of the U.S. House of Representatives and the U.S. Senate; an address to the closed annual meeting of the Council of Chief State School Officers; a presentation at the annual meeting of the Education Commission of the States; presentations at two special Education Writers Association conferences; an address to a Conference Board conference; addresses to the American Association of School Administrators, the American Society for Training and Development, Jobs for the Future, the American Federation of Teachers, National Council for Employment Policy, Southern Education Foundation, and the Southern Growth Policies Board. The staff held an American Educational Research Association symposium on the Center's work.

- Center staff have given numerous **research presentations** to their professional colleagues in the United States and Europe. These include presentations at the Eastern Psychological Association; American Anthropology Association; Center for Educational Research and Innovation; Association for Public Policy Analysis and Management; National Bureau of Economic Research Summer Institute; Princeton University, Department of Economics; University of Michigan, Department of Economics;

Rockefeller Institute of Government; University of Minnesota, Economics Department; Columbia University, Economics Department; Northwestern University, Department of Economics; Cornell University, Department of Economics; Econometric Society, Tokyo, Japan; Organization for Economic Cooperation and Development, Paris, France; Free University, Berlin; University of Lille, France; Nordic Society for Educational Research, Reykjavik, Iceland; and Swedish Employer Federation, Stockholm, Sweden.

- The Center director, as a member of **tasks forces and advisory boards**, has been able to use the Center's research to frame and inform the discussions of these bodies. They include the Advisory Panel for the National Assessment of Vocational Education; the New York State Task Force on Implementing Educational Reform; the National Panel on Youth and America's Youth, chaired by Willard Wirtz and John T. Dunlop; and two National Academy of Science Panels, one on the National Science Foundation data bases for scientific and engineering personnel and the other on issues of scientific labor supply and demand.

- The Center has **provided reports, information, or referrals** to literally thousands of individuals and organizations--for example, the Lilly Endowment, Indianapolis, IN; Ball Corporation, Chicago, IL; IBM Corporation, Rockville, MD; Foundation for the Advancement in Science & Education, Los Angeles, CA; AFL-CIO, Washington, DC; Boston Globe, Boston, MA; Newsweek Magazine; National Center for Fair and Open Testing; AETNA Institute for Corporate Education; Exxon Education Foundation; The Carnegie Forum on Education and the Economy; Mobil Foundation; Xerox Foundation; the American Council on Education; American Association for Adult and Continuing Education; the Chamber of Commerce of the United States; the E. McConnell Clark Foundation; and Research for Better Schools.

- Center work has appeared in a number of **popular press and educational publications as well as electronic media:** Education Week; Phi Delta Kappan; Insight magazine; radio station WOR-TV, New York; and The Johnson Foundation Wingspread radio; and newspapers, such as the Oakland Tribune. Center staff have helped journalists, magazine writers, and television program producers frame their articles or documentaries--for example, Edward Fiske of the New York Times; producers of a special MacNeil-Lehrer program on education; ABC Evening News; and a special ABC 20/20 documentary. In part because of these connections, the Center director was invited to participate in Fortune Magazine's Education Summit conference last fall.

- Center research findings were published in four editorials by national newspapers this last year. Two editorials by Albert Shanker appeared in The New York Times, entitled "Rethinking Failure and Success...And the School -Student Connection" and "A Cloudy Future for Jobs: Education Still Clear Choice." William Raspberry wrote in the Washington Post: "The Jobs Are There - Why Can't Our Kids Do Them?" and "Kids Whose Goals Are Too Modest." As a result of this press coverage, approximately another 1,000 copies of Center publications have been sent on demand or as part of special mailings.

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*** Papers with asterisks are available for $5.00 from the National Center on Education and Employment, Teachers College, Box 174, Columbia University, New York, New York, 10027. Papers without asterisks are available from their publishers.**

Center Publications

Occasional Paper Series

Berryman, Sue E. March, 1987. Shadows in the Wings: The Next Educational Reform.

Berryman, Sue E. July, 1987. Breaking Out of the Circle: thinking Our Assumptions About Education and the Economy.

Scribner, Sylvia. April, 1988. Head and Hand: An Action Approach to Thinking.

Berryman, Sue E. April, 1988. Education and the Economy: What Should We Teach? When? How? To Whom?

Noyelle, Thierry. April, 1988. Services and the New Economy: Toward a New Labor Market Segmentation.

Mincer, Jacob and Yoshio Higuchi. June, 1986. Wage Structures and Labor Turnover in the U.S. and in Japan.

Natriello, Gary. April, 1988. What Do Employers Want in Entry-Level Workers? An Assessment of the Evidence.

Technical Paper Series

Bailey, Thomas, and Thierry Noyelle. April, 1988. New Technology and Skill Formation: Issues and Hypotheses.

Bailey, Thomas. April, 1988. Education and the Transformation of Markets and Technology in the Textile Industry.

Sicherman, Nachum. December, 1988. "Over-Education" in the Labor Market.

Sicherman, Nachum. December, 1988. Education and Occupational Mobility.

Scribner, Sylvia. December, 1988. Experimental Studies on the Relationship of School Math and Work Math.

Mincer, Jacob. December, 1988. Education and Unemployment.

Digests

Bailey, Thomas and Thierry Noyelle. The Impact of New Technology of Skills and Skill Formation in the Banking and Textile Industries.

Natriello, Gary. Do We Know What Employers Want in Entry-Level Workers?

Harrington, Charles and Susan K. Boardman. Paths to Unusual Success.

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Altonji, Joseph. "The Effects of Family Background and School Characteristics on Education and Labor Market Outcomes."

Altonji, Joseph. "The Effects of High School Curriculum on Education and Labor Market Outcomes."

Altonji, Joseph. "Estimating the Returns to Education, Controlling for Personal, School, and Community Characteristics."

Altonji, Joseph. "Estimating the Returns to Education, Taking Account of Uncertain Educational Outcomes."

Bailey, Thomas. "Technology, Skills, and Education in the Apparel Industry."

Altonji, Joseph. "Changes in the Nature and STructure of Work: Implications for Skills and Skill Formation."

Bartel, Ann P. and Frank J. Lichtenberg. "Technological Change and the Interindustry Wage Structure."

Bodilly, Sue and David Menefee-Liby. "Mapping the Pittsburgh Work-Related Education System."

Glennan, Thomas K., Jr. "Community-Based Strategic Planning for Work-Related Education."

Glennan, Thomas K., Jr., and Jeannie Oakes. "Mapping the Work-Related Education System: Policy Issues and Data Needs."

Mincer, Jacob. "Human Capital Responses to Technological Change in the Labor Market."

Pascal, Anthony. "Alternative Futures for the Greater Pittsburgh Economy."

All Center Publications are available from the National Center on Education and Employment, Teachers College, Box 174, Columbia University, New York, New York, 10027. Costs for publications are as follows: Occasional Papers, $2.00; Technical Papers, $5.00; and Digest, Free.

Section I I

READING RESEARCH AND EDUCATION CENTER

University of Illinois
174 Children's Research Center
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Co-Directors: Richard C. Anderson
P. David Pearson

Associate Director: Jean Osborn

Sub-Contractor: Bolt, Beranek and Newman, Inc.

Mission

The primary mission of the Reading Research and Education Center is to conduct basic and applied research and to engage in practical programs that will produce a better understanding of the fundamental nature of the reading process, of how children learn to read, and of the role reading plays in the acquisition of knowledge in the humanities, social sciences, and natural sciences. For example, the Center seeks to understand important aspects of emergent literacy and the higher forms of literacy that entail the disciplined, planful use of the mind.

Examples of continuing programs of basic research at the Center include (1) perceptual processes in reading, (2) how metaphors and analogies are comprehended and the roles they may play in acquiring new knowledge, (3) the interplay between children's reading and their acquisition of scientific knowledge, (4) the representation and application of knowledge acquisition in the content areas, and (5) the structure of narrative and expository prose.

Examples of active programs of applied research include (1) the description and evaluation of instructional practices in elementary and middle school reading classes, (2) the analysis of reading and content area textbooks, (3) the development and validation of improved techniques for teaching reading, (4) the use of computer technology in innovative instructional programs, and (5) the training of teachers and students in the use of "framing" study techniques.

Examples of practical actions include (1) conducting teacher training institutes, (2) writing and distributing syntheses of research for teachers and other educators, (3) preparing and distributing pamphlets (in Spanish as well as English) about reading for parents, and (4) creating a radio documentary on

literacy, and (5) developing guides for teachers to use when evaluating reading programs.

Programs of Research	Principal Investigators
Acquisition of Knowledge and Skills Dedre Gentner	Patricia Edwards Jana Mason George McConkie Linda Meyer Stella Vosniadou David Zola
Instruction in Reading	Marilyn Adams Richard C. Anderson Bertram Bruce Dolores Durkin John Frederickson Georgia Garcia Violet Harris Paul Horwitz C. Liebling William Nagy Jean Osborn A. Rosebery Andee Rubin Beth Warren Phyllis Wilken
Text Characteristics	Thomas Anderson Bonnie Armbruster William Brewer James Levin Rand Spiro
Testing of Reading Proficiency and Evaluation of Instruction	David Pearson Diane Stephens

OERI Center Liaison: Anne P. Sweet
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Learning and Instruction Division
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Major Research Findings

- Studies of the effects of in-school and out-of-school independent reading on reading achievement found that the amount of time children spend reading books is significantly associated with several measures of reading ability in the fifth grade and that among all

the ways children spend their time, is the best predictor of growth in reading ability.

- Investigations of basal reading program teachers' manuals, student readers, workbooks, content area textbooks, and the effects of the use of readability formulas on both the writing and comprehensibility of the content of student textbooks established the need for what has been termed "considerate" text. It also identified problems created for students by inconsiderate texts as well as some of the sources of the inconsiderateness.

- Research on emergent literacy led to the development of effective guidelines for helping academically at-risk children. Procedures developed for use in kindergarten and head start classrooms include the teaching of sight words, text-reading, and writing as well an emphasizing phonological awareness, letter-sounds, and synthetic phonics. The research established the importance of reading-to-children activities that support both listening and reading comprehension.

- Work on reading assessment conducted as part of a collaborative effort with the Illinois State Board of Education led to the development of prototypes of new strategies and item formats for comprehension assessment that reflect current views of the reading process.

- Another collaborative effort with a public school system led to the training of 20 elementary school teachers to teach their students conceptual mapping techniques, that is to make graphic representations of the main ideas and the relationships of the other ideas in their social studies and science textbooks. Preliminary results indicate improved student learning.

- Vocabulary research that included an analysis of the vocabulary of printed school English permitted, with greater precision that ever before, the determination of the number and types of words that children encounter in their school reading. Experimental studies of children's incidental learning of word meanings from written context enabled the researchers to determine how much word learning actually occurs during normal reading and provided information about which properties of words and text most strongly influence word learning.

- Basic eye movement research deepened the understanding of the physiological and psychological underpinnings of the reading process. The research advanced current

knowledge about how both skilled and developing readers perceive text from moment to moment as they read and suggests that children use different strategies in their reading. It also studied the use of sophisticated computer-aided reading systems that help both children and adults make quantifiable improvements in their reading ability.

- Classroom research focusing on both oral and written language use and the role of new technologies such as word processors, data bases, and electronic networks in reading and writing provided information about how and why teachers change the way they teach reading and writing and led to new methods for improving students' reading, writing, and thinking skills both with and without the use of new technologies.

- A theory was developed and tested of learning, instruction, and knowledge representation for complex and ill-structured domains. Of special concern was the development of the kind of cognitive flexibility necessary for acquired knowledge to transfer to new situations.

- Basic and applied research on awareness of thought processes and how these processes can be controlled permitted the testing and refinement of hypotheses attempting to explain the metacognitive strategies skilled readers use as they read. Findings from the research in the form of reciprocal teaching strategies have been applied successfully in classrooms where low-achieving middle and high school students have dramatically improved their ability to understand what they read.

- A longitudinal study examining the sociological and psychological factors that, over time, can influence a student's acquisition of reading skill led to the development of new observation and testing techniques, the construction of a causal model to account for the operative factors that influence how, why, and how well children learn to read, and documentation not only of the family's important role in the learning process, but also of those elements of classroom instruction that most effectively foster the acquisition of reading skill.

Selected Accomplishments

- "The Longitudinal Study of Developmental Literacy" has produced data that are being used to produce causal models to study the relationship between early reading

instruction and learning from content area texts as well as other issues related to content area reading.

- "Explicit Comprehension Instruction: A Review of Research and a New Conceptualization of Instruction," a paper that synthesizes recent research about comprehension instruction, provides a historical perspective on classroom instruction of comprehension and formulates concepts about explicit comprehension instruction based on the most important studies of the last five or six years.

- "Improving the Textbook Selecting Process: Case Studies of the Textbook Adoption Guidelines Project" documents the effectiveness of a series of booklets entitled "A Guide to Selecting Basal Reading Programs," which is being developed for the purpose of helping textbook adoption committees to evaluate basal textbooks.

- "10 Ways to Help Your Children Become Better Readers" is a brochure that was developed through OERI's cooperative agreement with the University of Illinois at Urbana-Champaign for the RREC. The brochure is available in both English and Spanish versions, and several thousand copies have been distributed nationwide.

- The Center produced the Report of the National Commission on Reading, "Becoming a Nation of Readers." More than 200,000 copies of this book have been purchased by teachers and other educators, and it has been used by many school districts and state departments of education as the basis of training for teachers, school administrators, and members of the business community.

- During the past five years, Center research has appeared in 288 articles in professional journals and popular magazines; 71 articles in the Reading Research Quarterly between 1975 and 1985 were by Center authors. Center research was cited 159 times in the Reading Research Quarterly in 1985 alone. During the past ten years, members of the Center staff have written or edited approximately 40 books. These books offer a wide range of topics, content, and style and are intended for a variety of audiences. (For a listing of recent articles and books by Center staff, see the Publications section.)

- Center staff have appeared on the ABC World News Tonight, the CBS Evening News, and the NBC Today show, as well as dozens of local radio and television programs. Center research has been featured in the Reader's Digest and Time, and its work has been described in long, by-line articles in the Chicago Sun-Times, the

Chicago Tribune, the New York Times, the Boston Globe, the Los Angeles Times, the Hartford Courant, the Minnesota Tribune, and the Washington Post, as well as being mentioned more briefly in these and scores of other newspapers.

- During the past five years, Center staff members have delivered addresses, presented papers, appeared as discussants and panelists, and led workshops and institutes for approximately 300,000 people, mostly teachers.

Publications

Books and Articles

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Technical Reports and Reading Education Reports are available through the ERIC system. A limited number of reports that have not yet been assigned ERIC numbers are available through the Dissemination Manager of the Center, Room 174, 51 Gerty Drive, Champaign, IL 61820. Reports are $3.00 each, postpaid. We must collect sales tax or be furnished with a tax exemption number for these states: Illinois (6-1/4%), Wisconsin (5%), Ohio (5%), Indiana (5%), and Michigan (4%). Checks or money orders are to be in U.S. funds only, payable to the University of Illinois.

Section I I

CENTER FOR RESEARCH AND DEVELOPMENT ON SCHOOL LEADERSHIP

College of Education
University of Illinois at Urbana-Champaign
Urbana, Illinois 61801
(217) 333-2870

Director: Russell Ames (Illinois)
University High School
1212 West Springfield Avenue
Urbana, Illinois 61801

Mission

The Center will investigate school leadership as it relates to school culture and climate and to teaching, learning and student achievement. Qualitative and quantitative methods will be used to address both the theory and practice of leadership and conferences and publications will be employed to tie research results to current practice. Scholarly papers, assessment instruments and comparative analyses will supplement the central research activities.

Programs of Research	Principal Investigator
Integration and Conceptualization	Russell Ames Ellen Russell
School Leadership	Russell Ames Martin Maehr Alan Peshkin
School Culture and Climate	Martin Maehr Larry Braskamp
School Leader Training and Development Program	Russell Ames Samuel Krug Philip Kearney
School District Context for Effective Leadership	Robert Crowson Frederick Wirt Allen Odden

OERI Center Liaison Ronald Anson
Office of Research
Schools and School Professionals Division
(202) 357-6213

Research Focus

For FY '89, research will be conducted under five programs, with the addition of a sixth program contemplated for FY '90. The research addresses the theoretical aspects of leadership, the practical aspects and ways of providing training in leadership skills to education professionals. These five programs and the projects which address these areas of research are described below.

Integration and Conceptualization - This program will include a synthesis of literature on the relation of school leadership to 1) school culture and climate, and 2) teaching, learning and student achievement. This synthesis, along with other information, will be presented at a 2 1/2 day conference in June, 1989 for researchers and practitioners on school leadership. The conference will address: 1) critical issues in study of instructional leadership; 2) alternative research perspectives; and 3) integration of all the Center's efforts to date.

A summary of the conference and other Center research, entitled "What Works in Effective School Leadership," will provide practical advice for school leaders. This document will be supplemented by two newsletters on school leadership prepared for national dissemination.

School Leadership - This program will be comprised of three major projects. The first is the Illinois School Leadership Program. In its first year the project will verify a model of the relationship among school leader behavior, school climate, and student learning. The project will refine assessment methodology of existing pilot study of an hierarchical sample of principals, teachers, and students. I will also further validate instructional leadership constructs through experience sampling study of 100-150 principals, linking constructs to observed behaviors.

The second project of the School Leadership Program is a Qualitative Study of School Leadership, School Culture, and District Culture. This will involve a re-analysis of three existing qualitative data sets on school leadership and school culture. I will look at student characteristics and school characteristics. As a basis for this reanalysis, the researchers will undertake a literature synthesis of school leadership and school culture, instructional leadership literature, and the Personnel Investment Theory of Maehr and Braskamp.

The third project under this program is a set of papers prepared by visiting scholars: William Boyd of Penn State University, who will focus on micropolitics and principals; Charles Kerchner of

Claremont Graduate School who will prepare analyses of data linking achievement to leadership and organizational variables, and; Douglas Mitchell of University of California at Riverside, work orientations of principals (administration, leadership, supervision and management) as they relate to school mission.

School Culture and Climate, the third program, includes two major studies. The first project is a Study of School Culture and Student Learning. In this study, data from 4000 10th grade students in Illinois will be analyzed to determine the relationship between organizational culture (along five dimensions -- Accomplishment, Power, Recognition, Affiliation, and Mission) and student motivation and achievement. Also considered will be the modifying effects of students' sociocultural background, age and family/peer expectations.

The second project is a Refinement of Assessment Procedures. This project will revise, expand and validate the scales used in the Study of School Culture and Student Learning described above, as will as the three projects described under the School Leadership Program above. The project will suggest improvements in the procedures, surveys and inventories used in the noted projects.

The fourth program is the School Leader Training and Development Program. This program will field two projects aimed at evaluating current leadership practices. The first project, Field Tested Evaluation of Prototypical Administrator Assessment, Training, and Development Program, will be pilot test administrator assessment instruments to evaluate the process and content of assessment. The second project, Synthesis and Evaluation of Current Approaches to Administrator Training and Development, will survey LEAD programs to compare and contrast them to the "Illinois" approach.

The fifth and final program in the initial year is School District Context for Effective Leadership. It is comprised of three projects. The first project is Superintendent-Principal Interaction and School Leadership. It will include a report on the utility of agency theory to describe superintendent-principal interactions and a report on observations of facilitative and constraining effects of superintendent-principal relations on achievement from 10 districts. The second project is Administrator Conflict Management and Achievement Results. It is a study of superintendent's conflict management skills and their relation to achievement. Causes of conflict will be identified and measured through conflict biographies of administrators in high and low conflict situations. The third project is a study by a Visiting Scholar. This will be a longitudinal study of strategies and behaviors of 5

superintendents as they try to restructure the curriculum, the school and improve teacher professionalism. Specifically, it will look at curriculum restructuring to emphasize student problem solving skills, develop teacher career ladders, school restructuring, collegial teacher-administrator interactions and use of instructional technology to improve productivity. It will also investigate the effects of community characteristics and state policies on these efforts and will try to link the various factors to student learning.

CENTER FOR RESEARCH ON THE CONTEXT OF SECONDARY SCHOOL TEACHING

School of Education
Stanford University
Cubberly Hall - Building 325
Stanford, California 94305
(415) 723-4972

Director: Milbrey W. McLaughlin

Associate Director: Joan E. Talbert

Affiliated Institution: Michigan State University

Mission

The "School Context" Center mission is to discover how working conditions and other circumstances in schools affect teachers, promote or hinder effective teaching, and, ultimately affect student outcomes. An important objective of the Center is to provide policymakers and practitioners with information about how school policies and practices, especially those associated with recent reforms, relate to the school context, teachers, and teaching.

Programs of Research	Principal Investigators
Core Research Project on Secondary School Context	M. W. McLaughlin and J. E. Talbert
Unions as Context	M. W. McLaughlin and N. Bascia
Teacher Professionalism and School Contexts	R. Elmore and B. Rowan
Professional Development and Professional Community	J. W. Little
The Academic Department	M. W. McLaughlin and L. Siskin
Sources of Departmental Leadership and Authority	D. Hill
Subject Matter as Context for Teaching and Learning	S. Stodolsky
Content in Context, Content as Context: The Case of English	P. Grossman

Organizational Antecedents of Teacher Commitment and Teaching Practice	S. Raudenbush and B. Rowan
Contingency Studies of Context and Structure Effects on School Teaching Conditions	J. Hannaway and J. Talbert
Potentials for Assessing Classroom Teaching Effects with NELS: 88 Items and Samples	R. Snow
Statistical Models for Student and Teacher Outcomes in School Settings	D. Rogosa

OERI Center Liaison: Elizabeth J. Demarest
Office of Research
School and School Professionals Division
(202) 357-6207

Research Focus

The Center's research program combines two strategies: developing a core data base and conducting special, focused research projects that build upon and extend that core data base. Three interdependent data sets are being developed in the core research project: (1) qualitative field data from 16 high schools selected to represent important school context differences; (2) survey data for these high schools that include items from two major national surveys of high schools, High School and Beyond (HS&B and NELS:88); (3) national survey data from HS&B and NELS:88.

The goal of the core research project is to develop a comprehensive model of how school context and workplace conditions affect teachers, teaching and a range of student outcomes. The Center is especially interested in identifying and understanding those factors and conditions that influence teachers' and students' engagement in academic learning. In addition to context factors such as student characteristics, resources, district and state policies, the Center will examine the extent and ways in which departments and subject areas function as context for teaching.

Special projects supplement this comprehensive analysis of the secondary school context. These projects were selected to focus on particular, substantive or methodological issues that require special attention or that will be insufficiently examined as part of the core projects. They include research that inspects the

intersection of teacher, student and content in specific subject areas and aims to understand the ways in which "content is context", studies of the role of the academic department and the department's chair, and examination of the factors associated with teachers' sense of professionalism.

Parallel to these substantive research goals, the Center is pursuing activities that address the methodological challenges entailed in a research program on school context and in advancing techniques for integrating qualitative and quantitative, field-based and survey-based methods. The methodological goals of these efforts are to develop measures of teaching and learning that represent the significant differences associated with secondary education; to advance quantitative methods of multi-level modeling on school context and internal structural effects on teaching variables; to assess the utility of national longitudinal survey data for understanding teacher and context effects on a range of student outcomes; to conduct "bridging studies" that link quantitative and qualitative components of the research in ways that highlights the strengths and limitations of each strategy.

Publications may be obtained by writing to:

Center for Research on the Context of Secondary School Teaching
Stanford University - School of Education
CERAS Building
Stanford, California 94305

CENTER FOR RESEARCH ON THE EDUCATION OF DISADVANTAGED STUDENTS

School of Arts and Sciences
The Johns Hopkins University
3505 North Charles Street
Baltimore, Maryland 21218
(301) 338-7570

Director: Jomills H. Braddock II

Affiliated Institutions: University of California at Santa Barbara; Northern Arizona University; Teachers College, Columbia University; and the Council of Chief State School Officers

Mission:

The Center's mission is to significantly improve the education of disadvantaged students at each level of schooling through new knowledge and practices produced by thorough scientific study and evaluation. The Center's working definition of the "educationally disadvantaged" is students who are not succeeding or are under-achieving in school due to insufficient educational experiences in at least one of the three domains of school, family, and community. The strategy for carrying out the mission is to focus on the school as the major source of improvement in the education of the disadvantaged, to address the needs and interests of the educationally disadvantaged at all levels of development, to address the unique needs of language minority students, and to incorporate the family and the community into the school improvement effort.

Program of Research	Principal Investigators
Early and Elementary Education Program	Nancy Karweit Robert Slavin
Middle Grades and High School Program	Joyce Epstein Warren Hayman
Language Minority, Program	Jane Duran Alejandro Portes
School, Family, and Community Connections Program	Sandra Nettles

OERI Center Liaison: Ronald Pedone
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Research Focus

Early and Elementary Education Program

The primary goal of the Early and Elementary Education Program is to develop, evaluate, and ultimately disseminate instructional programs capable of bringing disadvantaged students to high levels of achievement, particularly in the fundamental areas of reading, writing, and mathematics. In particular, the goal of this program is to expand the range of effective alternatives which schools may use under Chapter 1 and other compensatory education funding and to study issues of direct relevance to federal, state, and local policy on education of disadvantaged students. By the end of the five-year funding period, Center staff expect to have identified effective early childhood programs, preventative reading programs, school-wide programs, classroom instructional programs, summer school and after school programs, family support and parent involvement programs, and intensive remedial programs capable of being used to ensure the success of all children.

Middle Grades and High School Program

Early adolescent students face personal dilemmas created by simultaneous and conflicting needs. For example, they need guidance from caring adults at the same time they need increasing independence and autonomy from adults. They need peer support and the comfort of conformity at the same time they need to develop unique and individual identities. The middle grades schools that serve these youngsters face dilemmas, as well. For example, these schools experience the simultaneous and often conflicting need to be responsive to student diversity, in order to allow individual growth and progress, but at the same time to provide challenging and common curricula to prepare all students for options in good high school programs.

The Middle Grades and High School Program will seek evidence on the effects of new organizational forms of schooling to resolve these dilemmas. These include alternatives to tracking and grouping practices that currently deflate disadvantaged students' self-image, alternatives to current evaluation and report card practices that currently punish poor students without recognizing or guiding improvement, alternatives to passive lecture and seatwork instructional approaches that currently bore and alienate students and suppress the joy and excitement of

learning, and alternatives to fixed time schedules for learning and testing that currently penalize students who need more time to learn and thus assure their failure.

The goal of the middle grades research program is to identify the components of this level of education that are especially important for disadvantaged early adolescents, that can be translated into practice, and that will predictably contribute to measurable "outcomes" of importance. For disadvantaged students, the important results of improved school and classroom organization are: higher rates of attendance, fewer retentions, more students on grade-level in reading, math, writing, science, social studies and foreign language, more students prepared for the academic programs in high school, more students with clear aspirations for high school and post-secondary education, more students with positive attitudes about themselves as students and about school as a place that helps them prepare for their future, and fewer dropouts in the middle grades and in high school.

The goal of the high school program is to pursue a plan of research and development that will result in more effective high schools for disadvantaged students. This area of research will include studies of effective dropout prevention programs, investigations of alternative school programs, research and development on specific approaches to boost student academic skills and to encourage students to respond positively to learning progress, evaluations of alternative approaches to create a close supportive social environment for "at risk" students, studies of high school programs that change the incentives for success in school, investigations of out-of-school influences on "at risk" youths, and research on specific high school effectiveness factors that can most help disadvantaged students.

Language Minority Program

The goal of the Language Minority Program is to investigate effective programs for disadvantaged Hispanic, American Indian, Southeast Asian, and other language minority children. The program's focus is on rigorous evaluations of practical, replicable programs which can increase the language skills of language minority children in their home language and in English and can accelerate the achievement of students in the traditional school subjects. Projects in the Language Minority Program will evaluate cooperative learning programs for Mexican-American and Indian students, community learning centers for Hispanic students, and extension of the Success for All Program to limited English proficiency Southeast Asian students, In addition, the Language Minority Program will investigate the causes of high school dropout among several immigrant groups.

Program on School, Family, and Community Connections

This program will focus on how teachers can form more productive partnerships with parents of disadvantaged students. The program will generate needed information about which parent involvement practices should continue and which should change across the grades, and how to inform and involve parents of disadvantaged students at all grade levels. The project will also develop useful teacher-training materials on effective parent involvement for teachers of disadvantaged students. The program will also study school and community connections. Here investigations will cover: (1) the different types of school and community connections that are designed especially to assist disadvantaged students, (2) the attitudes, situations and behaviors that promote or impede school and community efforts to implement viable and lasting programs, and (3) the effects of differently organized school and community partnerships on the learning and development of disadvantaged students.

Institutional Activities Program

The Institutional Activities Program will support four major projects. First, the center will establish a Research Partnership Network of Urban Schools. Members of the Network will provide center researchers with suggestions for critical issues to investigate and with feedback on research priorities and plans. Members will provide access to sites to conduct collaborative research. And members will participate in seminars to discuss current center work. Second, the center will work with the Council of Chief State School Officers to examine policy issues that affect schooling of the disadvantaged and to examine processes through which research findings can effectively reach and be useful to policy makers and education leaders. Third, the center will establish a National Minority Scholars Program that will support minority researchers both at the center and at other institutions. Fourth, the center will develop an Effective Programs Clearinghouse. This Clearinghouse will contain evaluations of programs for the disadvantaged that have been solicited from multiple sources -- especially evaluations that are not readily available to the general public.

CENTER FOR SCHOOL LEADERSHIP

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Director: Lee G. Bolman
Graduate School of Education
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Co-Director: Terrence E. Deal
George Peabody College of Education
Vanderbilt University
Nashville, Tenn. 37240

Affiliated Institutions: Vanderbilt University and University of Chicago

Mission:

The Center's mission is to conduct research and development in the area of school leadership. The research agenda of the Center for School Leadership will focus on three major questions: 1) what is good leadership, 2) how does good leadership come about and 3) what will good leadership mean in the future. These questions will be addressed through a series of research projects by staff at Harvard University, Vanderbilt University and the University of Chicago.

Programs of Research	Principal Investigators
What is Good School Leadership?	Lee Bolman Terrence Deal Carol H. Weiss Dan C. Lortie Susan Moore Johnson
How Does Good School Leadership Come About?	Lee Bolman Terrence Deal Catherine Marshall Jerry Murphy
What Will Good School Leadership Mean in the Future?	Willis Hawley Phillip Hallinger

OERI Center Liaison: David Stevenson
Office of Research
Schools and School Professionals Division
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Research Focus

The research agenda of the Center for School Leadership will focus on three major questions: (1) what is good leadership, (2) how does good school leadership come about and (3) what will good school leadership mean in the future.

Since the Center is newly funded the research agenda is not fully established. Currently, however, several projects are under way. One project directed by Carol Weiss examines who assumes leadership functions in schools. Several functions will be examined including monitoring the environment for problems and opportunities, framing issues and assigning priorities, bringing in new information, making decisions, and constructing meanings that make sense of what the school has done and is doing.

Another project that is directed by Dan Lortie will examine the interaction of leadership and context through a detailed panel study of novice and 'new' principals. The framework of the study focuses on the ideational and relational aspects of leadership, on personal orientations to education and on key relationships involved in the achievement of goals stemming from that orientation.

A third study will focus on new superintendents and their effects on schools. This study directed by Susan Moore Johnson will examine how leadership is exercised from the central office and what kinds of initiatives have the greatest impact on school and classroom practices.

A fourth project will examine four different conceptual maps or frames of leadership and the relationship of principals' cognitive sets to their actions and to the ways that they interpret the consequences of their actions. This project will be carried out by Bolman and Deal.

Other proposed studies are studying the antecedents and outcomes of school leadership, the kinds and effects of current practices in leadership preparation, leadership in restructured schools, and access of women and minorities to leadership positions.

All of these projects are designed to help in identifying what is good school leadership and the conditions in which it is found.

CENTER FOR TECHNOLOGY IN EDUCATION

Bank Street College of Education
610 West 112th Street
New York, New York 10025
(212) 663-7200

DIRECTOR: Karen Sheingold

COLLABORATORS: Bolt Beranek & Newman Inc.
Brown University
Harvard University

Mission

The Center's mission is to conduct research and development leading to an understanding and demonstration of how technology can improve student achievement, and consequently school productivity.

Programs of Research	Principal Investigators
Design Experiments	A. Collins
Practices and Barriers Study	K. Sheingold
Teacher Understanding of Technology Integration	M. Honey
Experimental Courses for Educators	C. Brunner
Expert and Novice Representations of Domain Knowledge	K. Spoehr
Intermedia	S. Gibbon and N. Yankelovich
Multimedia Environments	K. Wilson
Rochester Study	K. Sheingold
Home-school-community Studies	S. Goldman
New Technologies for Mastery Assessment in the Service of Learning	J. Fredriksen
Technology-Enhanced Domain Projects and Portfolios	H. Gardner
Assessment Research in Design Experiments	A. Collins

OERI Center Liaison: Doris Redfield
Office of Research
Learning and Instruction Division
(202) 357-6032

Research Focus

A general mandate of the Center for Technology in Education (CTE) is to conduct research on the teaching and learning of content, on school restructuring, and on the assessment of student learning. In keeping with the mandate, CTE will pursue three overall lines of research.

First, analyses of national patterns and issues will assess the current practices, opportunities and barriers with respect to particular issues of concern. For example, a major Practices and Barriers study is planned for year 1 (fiscal year 1989) that will address the integration of computers into school curricula. Studies 1, 2, 3, and 4 (listed above will address issues concerning the knowledge and skills teachers need to use technology-based instructional strategies. Studies 1 and 2 will address the effects of interaction among teachers, students, and advanced technologies on students' learning of content. Studies 1, 2, 4, 5, 6, and 7 will address the design of instructional strategies that exploit potentials of advanced technologies.

Second, a program of "design experiments" will be carried out collaboratively with schools to design and study the optimal conditions for the integration of technology into schools under varying constraints. Studies 1, 2, and 4 will address the use of technology in the structuring of schools to maximize student achievement. Study 9 will address the viability of using technological advances to promote the development of home-based education that is meshed with school-based instruction. Study 7 will address the potential of instructional delivery systems that are technologically advanced to enhance the productivity of schools.

Third, research and development projects will be undertaken to advance the adaptation and incorporation of technologies not currently available to schools in ways that offer possibilities for more effective learning environments. Assessment plays a key role in this effort -- assessment that clearly emphasizes learning and thinking processes. Studies 10, 11, and 12 will focus on technologically enhanced assessment of study learning processes. Studies 1, 4, 10, 11, and 12 will address technologically enhanced assessment to inform classroom instruction. Finally, this line of research will consider the use of advanced technology to facilitate analysis of student achievement data to inform the administrative organization of instruction in content areas.

CENTER FOR THE LEARNING AND TEACHING OF ELEMENTARY SUBJECTS

Michigan State University
College of Education
Erickson Hall
East Lansing, Michigan 48824-1034
(517) 353-6471

Co-Directors: Jere Brophy (517) 353-6470
Penelope L. Peterson (517) 355-1737

Mission

The Center for the Learning and Teaching of Elementary Subjects will identify exemplary practices, particularly for teaching and learning problem-solving and higher-order thinking; develop and test hypotheses through school-based research; and make specific recommendations for improvement of school policies, instructional materials, assessment procedures, and teaching practices. The Center focuses on the issues of (a) what content should be taught, (b) how teachers frame and focus their teaching to best utilize their resources, and (c) in what ways good teaching is subject matter-specific. The Center will address these issues as they relate to five elementary education subject areas.

Programs of Research	Principal Investigators
Ideal Curriculum, Instruction, and Assessment Practices in Elementary Content Areas	Jere Brophy
Integrated Studies of Current Practice	Penelope Peterson
Improvement of Existing Practice	Jere Brophy and Penelope Peterson

OERI Center Liaison: John Taylor
Office of Research
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Research Focus

This relatively new Center is conducting in-depth research and development studies on elementary-level (Grade K-6) teaching of mathematics, science, social studies, literature, and the arts, with particular emphasis on the teaching of higher level thinking and problem solving in each content area. The research will be

conducted in three phases using a unified approach that (a) applies a common set of data collection strategies to address a set of research questions studied in both public and private schools in each content area in each grade level; (b) addresses curriculum, instruction, and evaluation simultaneously and considers how they interact; (c) addresses both the intended curriculum (as envisioned by disciplinary experts, professional organizations, state and local education agencies, curriculum designers, and most directly, classroom teachers) and the enacted curriculum (as developed through teacher-student interaction in the classroom and as interpreted by individual students); and (d) addresses sequencing of content across grade levels and integration of instruction across subject matter areas in addition to issues involved in teaching within grade level and subject matter.

Phase I-deals with literature review and solicitation of expert opinion concerning the nature and measurement of higher level thinking and problem solving and the ways in which these outcomes should be incorporated into elementary instruction in the various content areas.

Phase I-Study 1 involves analysis and synthesis of expert opinion on higher order thinking and problem-solving in the elementary school years. (Ralph Putnam, coordinator)

Phase I-Study 2 involves discipline-based reviews describing historical developments and current thinking in each of several disciplines concerning what ought to be included in the elementary school curriculum. (Jere Brophy, coordinator)

Phase I-Study 3 involves panels of experts (university-based curriculum and instruction professors who are national leaders in the field and elementary teachers who have been recommended as outstanding practitioners) critiquing popularly used curriculum materials and suggesting improvements. (Richard Prawat, coordinator)

Phase II work consists of a set of complementary studies to describe the intended and enacted curricula currently being pursued in each of the content areas for elementary grades K-6. The design for these studies includes 6 school districts, 36 schools, and more than 125 teachers.

Phase II-Study 1 involves examining intended curriculum as described in policy statements by professional subject organizations, by state departments of education, and by local school boards concerning content, instruction, and assessment. (Donald Freeman, coordinator)

Phase II-Study 2 involves studying commonly used and distinctive curriculum materials and assessment instruments in each of the

subject matter areas to define clearly the kinds of problem solving and higher level thinking that might be addressed in each content area. (Cheryl Rosaen, coordinator)

Phase II-Study 3 involves examining the intended and enacted curriculum of classroom teachers through questionnaires and interviews. The amount of emphasis that teachers give to subject matter domains will be described, along with information about provisions for teaching each subject for conceptual understanding and higher order applications. (Ralph Putnam & Penelope Peterson, coordinators)

Publications

Books and Articles

Alberty, Elsie J., and Wanda T. May. 1987. "Curriculum: Then and Now." Theory Into Practice [Special Issue: Educational Perspectives: Then and Now] 2 6:319-23.

Carpenter, Thomas P., and Penelope L. Peterson. (Eds). 1988. "Learning Mathematics from Instruction." Educational Psychologist [Special Issue] 2 3:77-197.

Cianciolo, Patricia. 1987. "Developing the Beginning Reading Process with Picture Books." Journal of Library Services for Youth 1 (1):47-56.

Leinhardt, Gaea, and Ralph Putnam. 1987. "The Skill of Learning from Classroom Lessons." American Educational Research Journal 2 4:557-87.

Peterson, Penelope L. 1988. "Teaching for Higher-Order Thinking in Mathematics: The Challenge for the Next Decade." Pp. 2-26 in Perspectives on Research on Effective Mathematics Teaching, edited by D.A. Grouws and T.J. Cooney. Hillsdale, NJ: Erlbaum.

Porter, Andrew C., and Jere Brophy. 1988. "Synthesis of Research on Teaching: Insights from the Work of the Institute for Research on Teaching." Educational Leadership 4 5(8):74-86.

Putnam, Ralph T. 1987. "Mathematics Knowledge for Understanding and Problem Solving." International Journal of Educational Research 11:687-705.

Swing, Susan, and Penelope L. Peterson. 1988. "Elaborative and Integrative Thought Processes in Mathematics Learning." Journal of Educational Psychology 8 0:54-64.

Swing, Susan, Karen Stoiber, and Penelope L. Peterson. 1988. Thinking Skills versus Learning Time: Effects of Alternative Classroom-Based Interventions on Students' Mathematics Problem Solving. Cognition and Instruction 5 :123-191.

Center Publications

Blair, David. In press. On Mathematicians in Curriculum Reform in Elementary Mathematics.

Brophy, Jere. 1988. Teaching for Conceptual Understanding and Higher Order Applications of Social Studies (Elementary Subjects Series No. 3).

Cianciolo, Patricia. 1988. Teaching Critical Thinking Through the Use of Children's Literature.

Erbes, Robert. In press. Elementary General Music: A Discipline-Based Review.

Johnsen, William. In press. The Study of Literature as a Systematic Disciplinary Practice.

Putnam, Ralph, Magdalene Lampert, and Penelope L. Peterson. In press. Higher Order Thinking and Understanding in Elementary Mathematics: Alternative Perspectives.

Levine, Peter, and Peter Berg. 1988. History in the Elementary School Classroom (Elementary Subjects Series No. 2).

May, Wanda. 1988. Critical Thinking in Art and Music.

Prawat, Richard S. 1988. Promoting Access: The Role of Organization and Awareness Factors (Elementary Subjects Series No. 1).

Putnam, Ralph. Forthcoming. Thinking and Understanding in Elementary Schools: Perspectives on Subject Matter Learning.

Rosaen, Cheryl. 1988. Interventions to Teach Thinking Skills: Investigating the Question of Transfer.

Roth, Kathleen. In press. Conceptual Understanding and Higher Order Thinking in the Elementary Science Curriculum: Three Perspectives.

Publications may be ordered by writing to:

Center for Learning and Teaching of Elementary Subjects
252 Erickson Hall
College of Education
Michigan State University
East Lansing, MI 48824-1034

CENTER FOR THE LEARNING AND TEACHING OF LITERATURE

State University of New York at Albany
School of Education
1400 Washington Avenue
Albany, NY 12222
(518) 442-5026

Director: Arthur N. Applebee

Co-Directors: Judith A. Langer
Alan C. Purves

Mission

The mission of the Center for the Learning and Teaching of Literature is to provide an intellectual focus for literature research and practice; to conduct research that will contribute to the improvement of teaching and learning; and to act as a clearinghouse that promotes good practice in the teaching of literature. The Center is exploring fundamental issues in the literature curriculum which have the potential for improving classroom practice. To achieve this, the Center is examining the content and organization of the literature curriculum, processes of teaching and learning in literature classrooms, and the assessment of student performance. The research findings will be applicable to grades K-12 in both public and private schools.

Programs of Research	Principal Investigators
Current Emphases in Curriculum and Instruction	Arthur Applebee Sean Walmsley
Teaching and Learning Processes	Judith Langer Lil Brannon James Marshall
Assessment	Alan Purves Peter Johnston

OERI Center Liaison: Rita R. Foy
Office of Research
Learning and Instruction Division
(202) 357-6021

Research Focus

The research of this relatively new center falls into three major areas: 1) surveys of current practice in the teaching of

literature, including studies of both what is taught and how it is taught, 2) studies of alternative approaches to instruction and their effects on students' knowledge of literature and critical thinking abilities, and 3) studies of alternative approaches to the assessment of literature achievement, including both classroom-based and larger-scale approaches to testing. Each program area is directed by its own panel of teachers and scholars.

Research on Current Emphases in Instruction. The first step in the improvement of the learning and teaching of literature is to develop a comprehensive description of current practice: what is being taught, to whom, using what methods. Four Center projects are designed to provide this information: 1) a national study of the teaching of literature in the secondary school, 2) a national survey of major works taught in grades 7 through 12, 3) an analysis of the most frequently used literature anthologies, and 4) a study of elementary school precursors to secondary school literature instruction.

Teaching and Learning Processes. What skills and understandings do students develop in the study of literature? How can teachers best encourage the development of content knowledge and critical thinking skills? The projects in this strand will provide a context for understanding alternative approaches to the learning and teaching of literature. One study in this strand is examining the kinds of thinking junior and senior high school students engage in when they read short stories, poems, and expository passages. A second study focuses on literature instruction. A team of teachers and university-based researchers are examining the effects of alternative approaches to literature instruction on students' thinking strategies. A third study focuses specifically on classroom interaction, using videotapes of individual lessons as a means to analyze discussion processes and to provide effective models of alternative instructional techniques.

Assessment. One of the most effective strategies in the current educational reform movement has been to use large-scale testing to drive changes in curriculum. Testing of literature achievement, however, has remained largely untouched, partly because the domain has been poorly mapped and partly because of debates about the usefulness of literature. Studies in this strand will: 1) provide a comprehensive map of the domain of literary knowledge and of instruments available to test the domain, 2) examine the interrelationships among alternative measures and the usefulness of the information provided, and 3) develop classroom-based alternatives to large-scale assessment.

NATIONAL ARTS EDUCATION RESEARCH CENTER

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Nursing, and Arts Profession
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New York, New York 10003
(212) 998-5050

University of Illinois
at Urbana-Champaign
College of Applied and Fine Arts
105 Davenport House
809 South Wright Street
Champaign, Illinois 61820-6219
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Directors: Jerrold E. Ross (New York University)
Theodore Zernich (University of Illinois)

The Arts Education Research Center is jointly funded by the National Endowment for the Arts (NEA) and the Office of Educational Research and Improvement (OERI). The NEA will administer and monitor the Center. The Arts Education Research Center will have two locations: New York University and the University of Illinois, Urbana-Champaign.

Mission

The New York University (NYU) Arts Education Research Center's mission is to conduct research that uses both qualitative and quantitative methodologies to study the following four areas that have direct impact on the teaching of arts: (1) the nature of aesthetic response, (2) skill development in the arts, (3) acquisition of historical knowledge about the arts, and (4) enhancement of critical thinking abilities. Superimposed on these are issues concerning multicultural education, interrelated arts, and interdisciplinary studies. The first and second years of research will focus on art and music at the secondary school level in urban, rural, and suburban areas. Year three will study theater, also at the secondary level. The NYU Arts Center's primary objective is to identify and/or create models of excellence in teaching the arts, demonstrate how and why these models work, and disseminate the results of such research so that the models may be replicable in public and private schools across the nation.

The University of Illinois (UI) Arts Education Research Center is dedicated to developing a deeper understanding of the complex issues surrounding teaching, learning, and evaluation in the arts at the elementary and secondary levels. The principal mission is

to provide national leadership in three related areas: (1) conducting research that is germane to schools and schooling and that assesses the acquisition of knowledge and skills in the arts; (2) conducting research related to teaching and learning in the arts in elementary and secondary school settings; and (3) providing leadership for the arts teaching profession by disseminating information and organizing collaborative exchanges.

These institutions will coordinate their research agendas and collaborate on research activities and findings. The activities of the Center will be overseen by a single National Advisory Panel.

Programs of Research	Principal Investigators
New York University	
Processes of Successful Teaching and Curriculum Development in Arts Education	Jerrold E. Ross Ellyn Berk David Ecker Margot Ely Robert Landy Francine Shuchat-Shaw Sharon Weinberg Teacher-Members of the Center
Videotape Documentation of Successful Teaching in	Same as above
Educational Relationships Among the Schools and Cultural Institutions	Jerrold Ross Ellyn Berk
University of Illinois	
Development and Validation of Standardized Achievement Test in the Area of Artistic Processes and Techniques in Art History	George Hardiman
National Study on Literacy and Art Education	Ralph Smith
Role of Music in General Education	Harry S. Broudy

Status Surveys in Art, Visual, Dance and Drama in the Elementary and Secondary Schools	Burnet Hobgood George Hardiman Patricia Knowles
Drama/Theatre	Burnet Hobgood
Visual	George Hardiman
Dance	Patricia Knowles
Influence of Culture Condition on the Learning of Arts	Brent Wilson
Development of Computer Assisted Testing (Music Education)	David Peters
Design of Studies in Dance	Patricia Knowles
Designs of Studies in Theatre	Burnet Hobgood
Status Survey of Music Education in Elementary and Secondary Schools	Richard Colwell
Motivation in Music	Martin Maehr
Arts Education Field Work: Observational Studies	Robert Stake

Center Liaisons:

NEA Center Liaison: Warren B. Newman
National Endowment for the Arts
(202) 682-5400

OERI Center Liaisons: Norma Lindsay
Office of Research
Learning and Instruction Division
(202) 357-6021

Research Focus

This relatively new center will undertake a program of research and dissemination to further efforts of the National Endowment for the Arts and the U.S. Department of Education in advancing teaching and learning in the arts in grades K-12. More specifically, the Arts Education Research Center will conduct directly or contract other institutions to carry out a program of research and dissemination in arts education. The main purposes

of the Arts Education Research Center are to identify and/or create models of excellence in teaching the arts, demonstrate how and why the arts work, and disseminate the results of such research so that the models may be replicated across the nation.

The center will develop models suitable to secondary schools in urban, suburban, and rural settings, and, may also develop models suitable to the elementary school level in the aforementioned demographic settings.

NATIONAL CENTER FOR RESEARCH IN MATHEMATICAL SCIENCES EDUCATION

Wisconsin Center for Education Research
University of Wisconsin at Madison
1025 West Johnson Street
Madison, Wisconsin 53706
(608) 263-4285

Director: Thomas A. Romberg

Mission

The National Center for Research in Mathematical Sciences Education has a research program that seeks to provide a research base for the reform movement in school mathematics. NCRMSE is addressing the integration of knowledge about teaching and learning mathematics, the relationship between mathematics content matter and the curriculum, and mathematics assessment. The activities focus on two areas: Instruction/Learning and Curriculum/Assessment. The programmatic research design addresses (1) how to build relationships between research on students' cognition and problem-solving ability and research on instruction in the content specific areas of Early Arithmetic, Algebra, Geometry, and Rational Numbers; and (2) how to build a relationship between current efforts to reform the school mathematics curriculum and the procedures and techniques of assessing student achievement in mathematics as a result of studying the curriculum. The latter relationship is examining the nature of the current curriculum reform movement, the state of current practice and the problem of curriculum alignment, and the influence of assessment in the curriculum.

Programs of Research	Principal Investigators
Learning and Instruction of Algebra, Early Arithmetic, Geometry, and Rational Numbers	Elizabeth Fennema Thomas Carpenter
Mathematics Curriculum and Assessment of Mathematics Study	Thomas Romberg

Research Affiliates

Harriett Bebout, University of Cincinnati
Joanne Becker, San Jose State University
Merlyn Behr, Northern Illinois University
Don Bernard, University of Florida
Catherine Brown, Virginia Polytechnic Institute
David Clarke, Institute of Catholic Education
Debra Clithro, Springfield, Missouri, Schools
Paul Cobb, Purdue University

Jan deLange, Rijksuniversiteit Utrecht, Holland
Karen Fuson, Northwestern University
Douglas Grouws, University of Missouri
John Harvey, University of Wisconsin-Madison
James Kaput, Southeastern Massachusetts University
Mary Koehler, San Diego State University
Magdalene Lampert, Michigan State University
Carolyn Maher, Rutgers University
Douglas McLeod, Washington State University
Barbara Pence, San Jose State University
Thomas Post, University of Minnesota
Sidney Rachlin, University of Hawaii
Leslie Salmon-Cox, University of Pittsburgh
Tom Schroeder, University of British Columbia
Walter Secada, University of Wisconsin-Madison
Sharon Senk, University of Chicago
Paul Smithdale, University of Pittsburgh

OERI Center Liaison: Steven Kirsner
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Research Focus

The Learning/Instruction Project is studying how knowledge from cognitive and instructional sciences can be integrated to design more effective instruction in mathematics. Researchers are focusing on three basic questions: (1) How can research in students' cognition be applied to problems of classroom instruction; (2) What kinds of knowledge about students' thinking and problem solving is most useful for addressing problems of instruction; and (3) Can models for studying classroom instruction be developed that are consistent with what we know about individual students' learning and problem solving? Early in 1988, a conference was held at which groups of researchers were established to work on these problems in the areas of arithmetic, rational numbers, algebra, and geometry.

The Curriculum/Assessment Project is examining current efforts to reform the school mathematics curriculum and the procedures and techniques of assessing student achievement related to that reformed curriculum. This project is employing a number of research techniques to help gain insights to such questions as: What fundamental knowledge should be taught to students? How should the school mathematics curriculum be organized and sequenced? How should new technology (e.g. calculators, computers) be incorporated into the mathematics curriculum? How should the relationships between mathematics and other subjects be incorporated into the curriculum? How does the current

intended curriculum as prescribed by the state, the district, the school, or the teacher differ from concepts of an ideal curriculum? How does what is actually taught differ from both the current intended curriculum and an ideal curriculum? What content areas are most in need of change? What is the relationship between what is actually taught, what is intended, and what is ideal, on the one hand, and what is tested, on the other? Do tests provide valid information on student achievement, especially in areas such as problem solving, higher order thinking, applications? How? Why? What are alternative ways of getting valid information on student achievement? Do tests influence curricular changes or teaching practices? How? Do tests influence learning? How? How can the information derived from answering the previous questions be used to help prepare effective curriculum materials such as textbooks, computer software and tests?

Publications

Monograph

Fennema, E., Carpenter, T., & Lamon, S. (Eds.) 1988). Integrating Research on Teaching and Learning Mathematics. Proceedings of the First Wisconsin Symposium for Research on Teaching and Learning Mathematics, Madison, Wisconsin.

Research Report

Romberg. T. A., Zarinnia, E. A., & Williams, S. (December 1988). The Influence of Mandated Testing on Mathematics Instruction: Grade 8 Teachers' Perceptions. Madison, WI: National Center for Research in Mathematical Science Education, University of Wisconsin.

Occasional Papers

Romberg, T. A. (November, 1987). The Domain Knowledge Strategy for Mathematical Assessment. Project Paper #1, National Center for Research in Mathematical Sciences Education, University of Wisconsin, Madison.

Publications may be obtained by writing to:

National Center for Education Research
University of Wisconsin at Madison
1025 West Johnson Street
Madison, Wisconsin 53706

THE NATIONAL CENTER FOR IMPROVING SCIENCE EDUCATION

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Associate Director: Susan Loucks-Horsley

Affiliated Institution: Biological Sciences Curriculum Study (BSCS)

Mission

The National Center for Improving Science Education will provide conceptual and practical leadership across areas of major interest in science education, by promoting changes in state and local education agency policies and practices that affect science assessment, curriculum, and teaching. In doing so, the Center will serve as a mechanism to bridge gaps between research and practice in science education by synthesizing what is known from current research and practice. The Center's research agenda is comprised of a series of integrative studies that will enable it to (1) understand the current status of science curriculum, assessment, and teaching; (2) enhance, link and integrate current efforts to establish what ought to be the future of science education; and (3) create products and processes that will help science education progress towards this new vision. The Biological Sciences Curriculum Study (BSCS) is a partner in carrying out the mission and activities of the Center.

Programs of Research	Principal Investigators
Science Assessment	Senta Raizen
Science Curriculum and Instruction	Rodger Bybee
Science Teachers and Teaching	Susan Loucks-Horsley

OERI Center Liaison: Wanda Chambers
Office of Research
Learning and Instruction Division
(202) 357-6021

Research Focus

This relatively new center is conducting two major strands of research: (1) research synthesis studies, and (2) small-scale feasibility studies. Each of the three years will focus on a different level of schooling, beginning with the elementary school, then the middle grades, and finally the high school. The first strand of research is a set of synthesis studies of science education research and practice in the areas of (a) science assessment, (b) science curriculum and instruction, and (c) science teachers and teaching. The first project in this series of studies focuses on what science skills and knowledge are being assessed, which ones should be assessed, and how. The second study updates our understanding of what is currently being taught in schools and how, and proposes a curriculum framework and instructional model drawn from research and practice that could form the foundation for science teaching. The third project considers the knowledge and skills of science teachers and how their preparation, staff development opportunities, and school and district structures and facilities support their teaching of science.

Each year the Center conducts a series of feasibility studies, small-scale studies of topics identified as gaps by the synthesis studies, that relate to the three program strands. In Year 1 the first study focuses on the kind of tests teachers construct to assess their students' science learning, and what use they make of the information collected. The second study explores the needs that teachers and school administrators would have should they desire to implement a new vision of science education, as represented by the curriculum framework and the instructional model resulting from the curriculum and instruction project. This study also explores the role of the state education agency and district office in meeting those needs. A third feasibility study is developing "case stories" of successful implementation of key components of the curriculum framework and instructional model, examining the factors that inhibit and those that support use of such innovative approaches. In subsequent years, different feasibility studies will be conducted, depending on gaps identified by the synthesis studies.

Publications

Reports of three synthesis studies of elementary school (1) science assessment, (2) science curriculum and instruction, and (3) science teachers and teaching. Available January 1, 1989.

Integrated report on elementary school science education. Available February 1, 1989.

Implementation guides for improving science education in elementary schools for (1) local educators, including district and building administrators, and (2) state-level educators, including state science supervisors and education commissioners. Available March 1, 1989.

Guidelines for improving science education in elementary schools for specific groups such as teachers, parents, school boards, teacher educators, and scientists.

Similar publications will be available in succeeding years for the middle grades (early in 1990) and high school (early in 1991).

Publications will be available through the Center's Andover office.

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